9-2350-257-34-2-4

TM 9-2350-257-34-2-4

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TECHNICAL MANUAL

DIRECT SUPPORT
AND GENERAL SUPPORT
MAINTENANCE MANUAL

PART 4
MAINTENANCE

TURRET
FOR TANK, COMBAT, FULL-TRACKED: 105-MM GUN, M60A1 (RISE) (2350-00-116-9765) AND M60A1 (RISE PASSIVE) (2350-01-059-1503)

This copy is a reprint which includes current pages from Changes 1 through 3.

HEADQUARTERS, DEPARTMENT OF THE ARMY

READEX FICHE best copy available

JULY 1980

D101.11:

WARNING

BE CAREFUL: CARBON MONOXIDE IS A GAS THAT CAN KILL YOU

Carbon monoxide always comes when something gets hot or burns - such as heaters, engines, etc. To keep carbon monoxide from making anyone sick or drowsy, there must be plenty of fresh air in the place where the heating or burning takes place. This gas has no color and no smell, but it is deadly poisonous. It can damage your brain, or kill you, if you do not have enough fresh air coming in to push the carbon monoxide out.

Follow these rules to keep from getting poisoned:

1. Do not operate engine or heater inside a building unless there is plenty of fresh air coming in.
2. Do not idle an engine unless you are sure there is plenty of fresh air in personnel compartments.
3. Do not drive a vehicle which has inspection plates, cover plates or engine compartment doors taken off, except for very short maintenance times when necessary.
4. When operating vehicle, always be on the lookout for personnel who seem to be getting sick or drowsy. If you notice this happening, immediately get fresh air into personnel compartments. If this does not help, remove sick or drowsy personnel from vehicle and do following:
    a. Put him into fresh air.
    b. Keep him covered warm.
    c. Keep him still. Do not let him exercise. (Exercise will make him worse.)
    d. Give him artificial respiration, if necessary.
    e. Get medical help.

TM 9-2350-257-34-2-4
C2

CHANGE

No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC 30 November 1987

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

PART 4
MAINTENANCE

TURRET
FOR TANK, COMBAT, FULL-TRACKED: 105-MM GUN, M60A1 (RISE) (2350-00-116-9765) AND M60A1 (RISE PASSIVE) (2350-01-059-1503)

TM 9-2350-257-34-2-4, 1 July 1980, is changed as follows:

1. Remove old pages and insert new pages as indicated below.
2. New or changed material is indicated by a vertical bar in the margin of the page.

Remove Pages	Insert Pages
13-395 through 13-398	13-395 through 13-398
13-401 through 13-408	13-401 through 13-408
13-413 and 13-414	13-413 and 13-414

File this sheet in the back of the publication for reference purposes.

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-37, Direct and General Support Maintenance requirments for Tank, Combat, Full Tracked, 105-MM, M60A1 RISE and M60A1 RISE PASSIVE.

CHANGE

No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 18 February 1987

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

PART 4
MAINTENANCE

TURRET FOR TANK, COMBAT, FULL-TRACKED: 105-MM GUN, M60A1 (RISE) (2350-00-116-9765) AND M60A1 (RISE PASSIVE) (2350-01-059-1503)

TM 9-2350-257-34-2-4, 11 July 1980, is changed as follows:

1. Remove old pages and insert new pages as indicated below.

2. New or changed material is indicated by a vertical bar in the margin of the page.

3. New or changed illustrations are indicated by a miniature pointing hand highlighting the change.

4. The nomenclature for grenade launcher is changed to grenade discharger throughout this manual.

Remove Pages	Insert Pages
i and ii	i and ii
13-123 and 13-124	13-123 and 13-124
13-139 through 13-146	13-139 through 13-146
13-389 through 13-394	13-389 and 13-394
Index 1 and Index 2	Index 1 and Index 2
FO-5	FO-5

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By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-37, Direct and General Support Maintenance requirements for Tank, Combat, Full Tracked, 105-MM, M60A1 RISE, and M60A1 RISE PASSIVE.

WARNING

WARNING
RADIATION HAZARD

Azimuth dial pointers in indicator are tipped with radioactive material. This becomes dangerous when dial window is broken or removed. When this happens, make repairs as soon as possible.

All maintenance must be done at depot level only, except replacement of lamps or replacement of whole indicator unit.

Protecting, handling, storing, and getting rid of radioactive material must be done in accordance with TB MED-232 and TB 750-237.

WARNING

Be careful when working around pressurized parts. Hydraulic fluid under pressure can hurt you.

WARNING

Before charging main accumulator, hydraulic system pressure must be lowered to 0 psi. Hydraulic fluid under pressure can hurt you.

WARNING

Before draining hydraulic system, pressure must be lowered to 0 psi. Hydraulic fluid under pressure can hurt you.

WARNING

Before removing hydraulic tubes, hydraulic system pressure must be lowered to 0 psi. Hydraulic fluid under pressure can hurt you.

WARNING

Before traversing turret, make sure gun will not hit anything if turret is traversed. If necessary, move vehicle.

WARNING

Nitrogen under pressure can hurt you. Keep fingers and hands clear of valve while letting out nitrogen. Let nitrogen out slowly.

Technical Manual
No. 9-2350-257-34-2-4

HEADQUARTERS.
DEPARTMENT OF THE ARMY
Washington, D.C., 11 July 1980

Technical Manual Direct Support and General Support Maintenance

TURRET

FOR TANK, COMBAT,

FULL-TRACKED:

105-MM GUN,

M60A1 (RISE)
(2350-00-116-9765)
AND
M60A1 (RISE PASSIVE)
(2350-01-059-1503)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know.

Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to:

Commander
US Army Armament, Munitions and Chemical Command
ATTN: AMSMC-MAS
Rock Island, IL 61299-6000

A reply will be furnished to you.

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* This manual in conjunction with TM 9-2350-257-34-2-1, TM 9-2350-257-34-2-2, TM 9-2350-257-34-2-3, TM 9-2350-257-34-2-5, and TM 9-2350-257-34-2-6 supersedes TM 9-2350-257-34-2, December 1975, and so much of the DS/GS portion of TM 9-1000-213-35, April 1976, as pertains to the M60A1 (RISE) and M60A1 (RISE PASSIVE) Tanks, including all changes.

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CHAPTER 13
POWER PACK

Section 1. SCOPE

13-1. LIST OF EQUIPMENT ITEMS CONTAINED IN THIS CHAPTER

Section	Equipment Item	Paragraph
2	Power Pack	13-2
3	Manual Elevation Accumulator	13-7
4	Hydraulic Riser	13-11
5	Shuttle Valve	13-18
6	Drain Tube	13-25
7	Check Valve	13-28
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Section 2. POWER PACK

13-2. MAINTENANCE PROCEDURES INDEX

	Tasks			
Equipment Item	Removal	Installation	Disassembly	Assembly
Power Pack	13-3	13-4	13-5	13-6

13-3. POWER PACK REMOVAL PROCEDURE

TOOLS: 3/16" socket head screw key (Allen wrench)
6" extension (1/2" drive)
3/4" socket (1/2" drive)
1/2" drive ratchet
Adjustable hook spanner wrench
9/16" open end wrench
11/16" open end wrench
7/8" open end wrench
1" open end wrench
Hoist
Slip joint pleirs with plastic jaws (connector pliers)

SUPPLIES: Wood block (4"x4"x18") (two) To support power pack after removal
Wood block (2"x2"x6") (two) To place under electric motor
Wood block (2"x6"x12") (two) To support power pack in and out of vehicle
Caps and plugs
Lint-free cloths and rags (item 21, App. A)
Masking tape (item 36, App. A)
Pencil
Rope (3/4" diameter x 20 feet long)

PERSONNEL: Three

REFERENCES: JPG for procedures to:
- Tag hydraulic tubes
- Disconnect electrical connectors

TM 9-2350-257-20-2-3 for procedures to:
- Drain turret hydraulic system
- Remove stabilization control selector
- Remove gunner's control box and bracket
- Remove gunner's seat
- Remove gunner's footrest
- Remove motor blower ducts

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Main Accumulator	FO-1	19
Gunner's Control Handles	FO-1	26
Power Pack	FO-1	18
Gunner's Control	FO-1	5

13-3. POWER PACK REMOVAL PROCEDURE (CONT)

EQUIPMENT CONDITION:
Driver's master control panel MASTER BATTERY switch set to OFF
Turret hydraulic system drained (TM-20-2-3)

Stabilization control selector removed (TM-20-2-3)
Gunner's control box (switch box) and bracket removed (TM-20-2-3)
Gunner's seat removed (TM-20-2-3)
Gunner's footrest removed (TM-20-2-3)
Motor blower ducts removed (TM-20-2-3)

GENERAL INSTRUCTIONS:

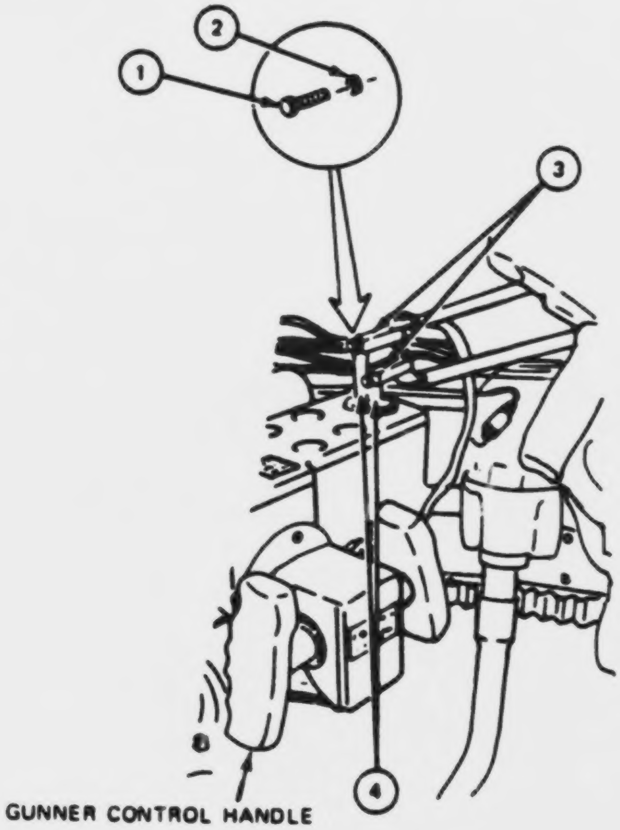
CAUTION

Hydraulic parts must be protected from dirt after removal. Dirt can damage hydraulic parts. Lint-free cloths, caps, and plugs should be used to keep hydraulic parts clean.

13-3. POWER PACK REMOVAL PROCEDURE (CONT)

FRAME 1

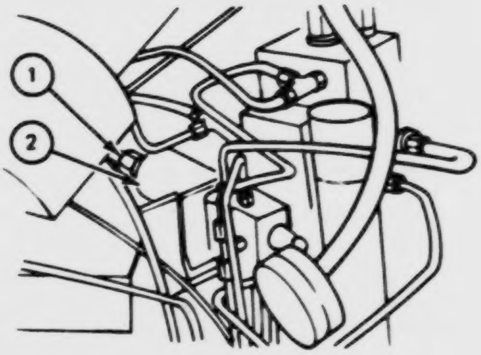
Step	Procedure
1.	Using Allen wrench, remove two screws (1) and two lockwashers (2) that attach control levers (3) to commander's control shafts (4).
2.	Remove two control levers (3) from control shafts (4).
	GO TO FRAME 2



13-3. POWER PACK REMOVAL PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Disconnect electrical connector (1) from deck clearance valve solenoid (2) (JPG).
2.	Using pliers, disconnect electrical connector (3) from bottom of gunner's control (4) (JPG).
3.	Using pliers, disconnect electrical connector (5) from top of gunner's control (4) (JPG).
4.	Using spanner wrench, disconnect electrical connectors (6) from power pack motor (7) (JPG).
	GO TO FRAME 3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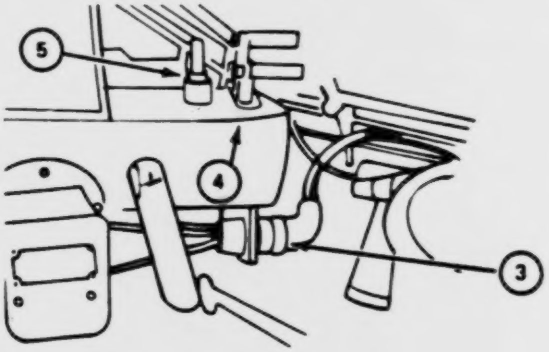

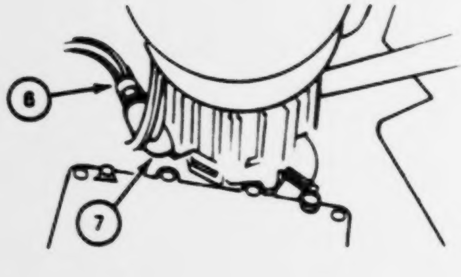
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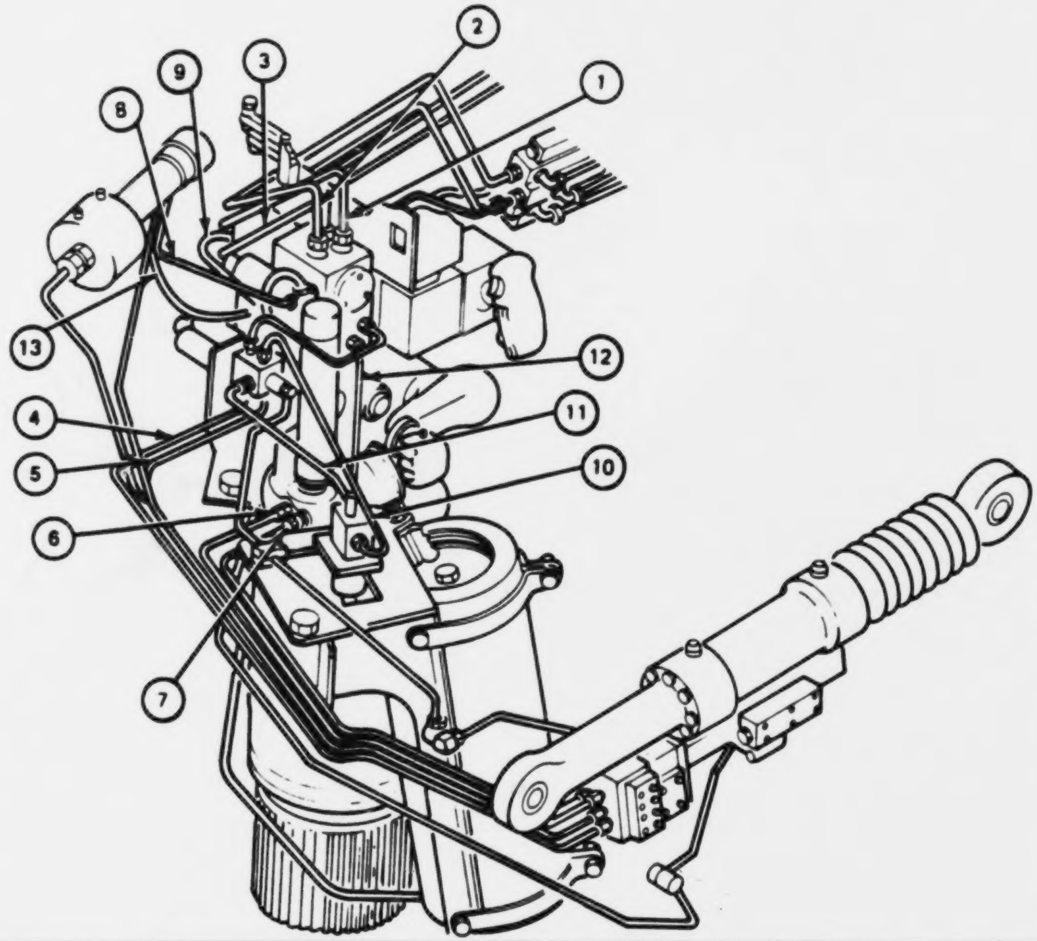
7

13-3. POWER PACK REMOVAL PROCEDURE (CONT)

FRAME 3

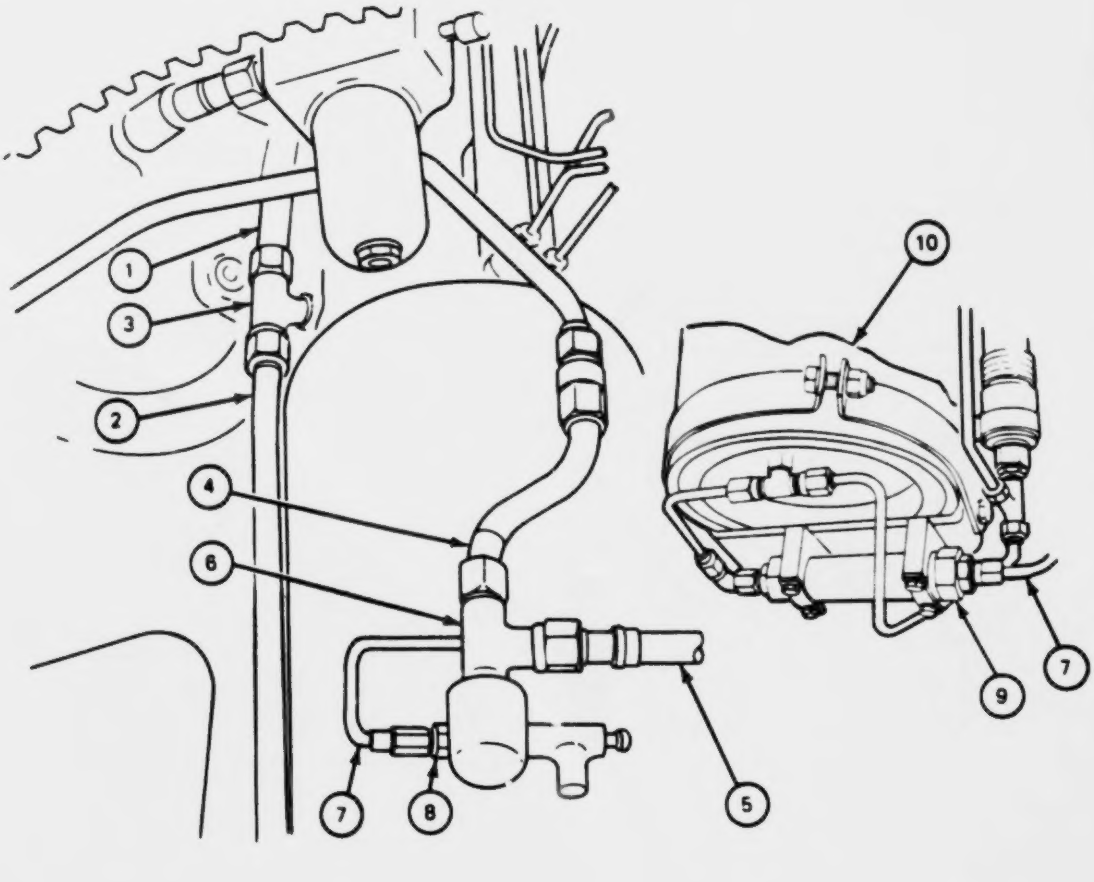
Step	Procedure
1.	Using 7/8" and 1" open end wrenches, disconnect two tubes (1) and (2) from power pack. Tag tubes (JPG).
2.	Using 9/16" and 5/8" open end wrenches, disconnect eleven tubes (3) thru (13) from power pack. Tag tubes (JPG). GO TO FRAME 4



13-3. POWER PACK REMOVAL PROCEDURE (CONT)

FRAME 4

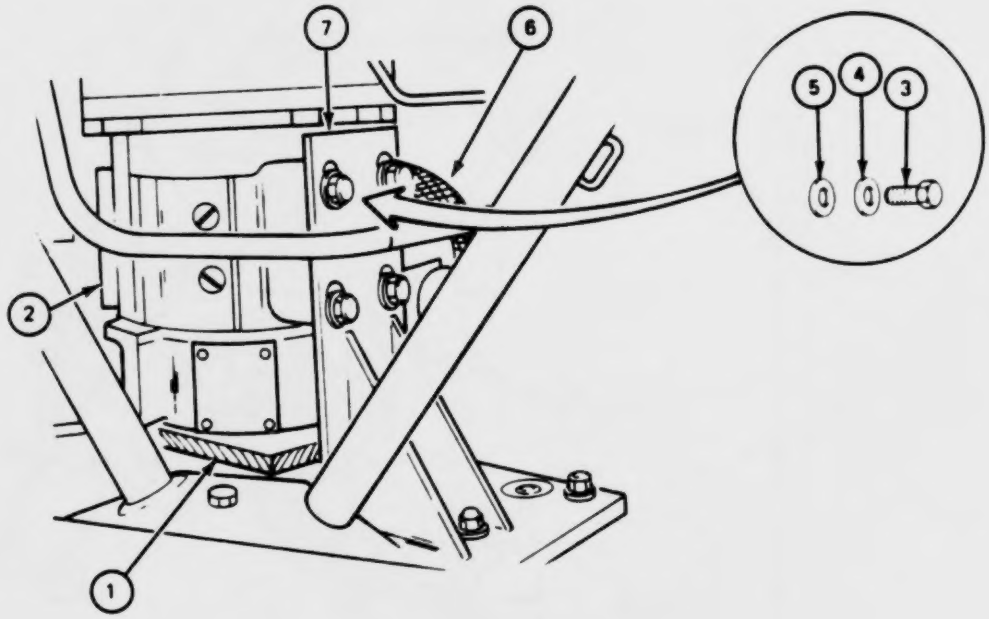
Step	Procedure
1.	Using 1" open end wrench, disconnect tubes (1) and (2) from riser port HP tee (3). Tag tubes (JPG).
2.	Using 1" open end wrench, disconnect tubes (4) and (5) from drain tee (6). Tag tubes (JPG).
3.	Using 9/16" open end wrench, disconnect and remove tube (7) from drain (8) and relief valve (9) on main accumulator (10). Tag tube (JPG). GO TO FRAME 5



13-3. POWER PACK REMOVAL PROCEDURE (CONT)

FRAME 5

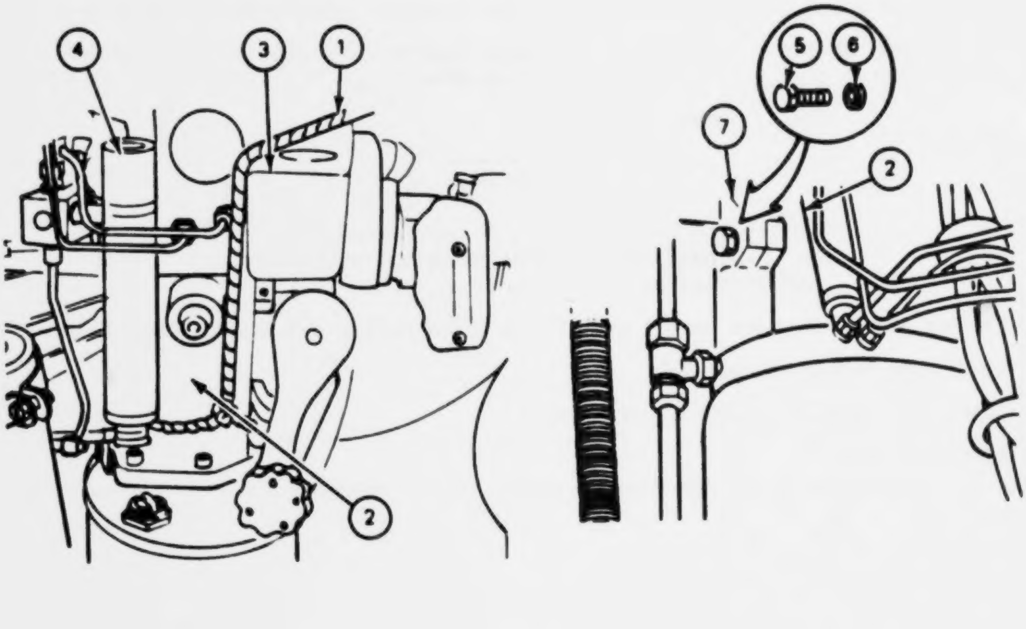
Step	Procedure
1.	Put two (2"x2"x6") blocks of wood (1) under motor (2) to support power pack. Do not put wood under bearing hump at center of motor.
2.	Using socket wrench, remove four screws (3), four lockwashers (4), four flat washers and ground strap (6) that attach motor (2) to bracket (7). GO TO FRAME 6



13-3. POWER PACK REMOVAL PROCEDURE (CONT)

FRAME 6

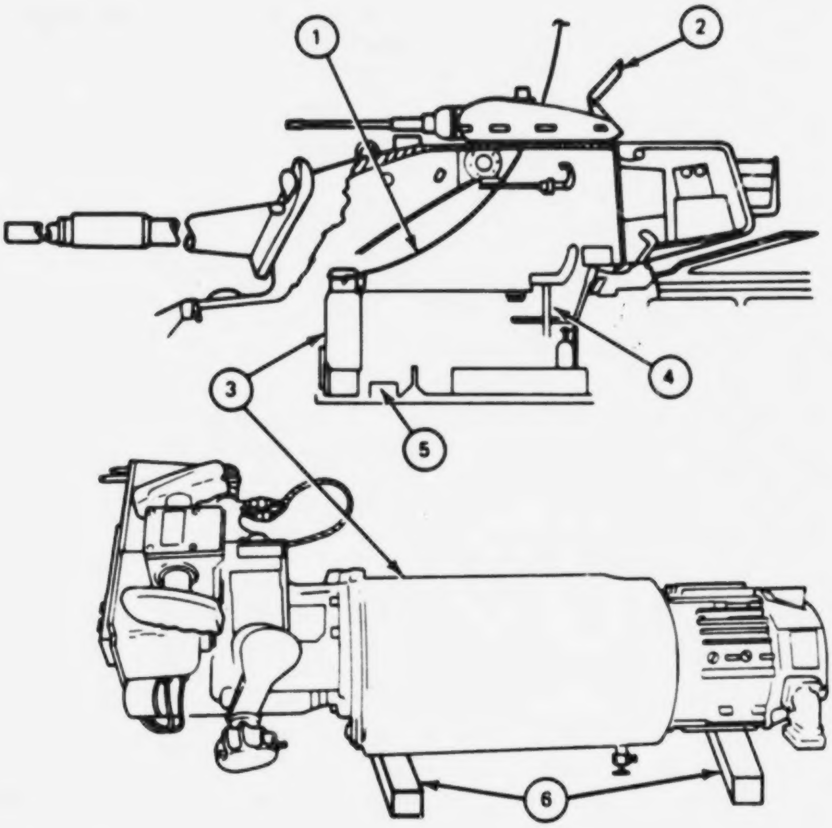
Step	Procedure
1.	Tie rope (1) around riser (2) under gunner's control (3). Run rope between accumulator (4) and riser (2), up and over top of gunner's control (3). **CAUTION** Hold power pack to keep it from falling.
2.	Using socket wrench and extension, remove two screws (5) and two lockwashers (6) that attach riser (2) to bracket (7). GO TO FRAME 7



13-3. POWER PACK REMOVAL PROCEDURE (CONT)

FRAME 7

Step	Procedure
	WARNING Power pack weighs approximately 280 pounds. Handle it with care so no one is hurt.
1.	Put hoist hook (1) down through cupola hatch (2).
2.	Tie rope around power pack (3) and attach to hoist hook (1).
	CAUTION Be careful while moving power pack across floor of turret. Do not rest weight of power pack on relay control box, because you may damage it.
3.	Soldier A and Soldier B with help from hoist, move power pack (3) close to commander's seat (4), without resting weight of power pack on relay control box (5).
4.	Using hoist, lift power pack (3) from vehicle. Soldier A, Soldier B, and Soldier C guide power pack through cupola hatch (2) as it is lifted.
	CAUTION When power pack (3) is laid on wood blocks, take care not to damage tubes or ports, or to rest weight against gunner's handles.
5.	Outside of vehicle, lower power pack (3) to clean surface and lay on wood blocks (6).
6.	Untie rope from power pack (3).
7.	Using rag, clean up spilled hydraulic fluid.
	END OF TASK



13-4. POWER PACK INSTALLATION PROCEDURE

TOOLS: 1/2" drive ratchet
6" extension (1/2" drive)
Hoist
3/4" socket (1/2" drive)
7/8" open end wrench
9/16" open end wrench
3/4" open end wrench
1" open end wrench
Adjustable hook spanner wrench
3/16" socket head screw key (Allen wrench)
Slip joint pliers with plastic jaws (connector pliers)

SUPPLIES: Wood blocks (2"x2"x6") (two)
Lint-free cloths (item 21, App. A)
Wood blocks (12"x12"x12") (two)
Rope (3/4" diameter x 20 feet long)

PERSONNEL: Four

REFERENCES: TM 9-2350-257-10 for procedures to:
- Traverse turret
- Check main accumulator nitrogen charge

JPG for procedure to install electrical connectors

TM 9-2350-257-20-2-3 for procedures to:
- Install motor blower ducts
- Install gunner's control box mounting bracket
- Install stabilization control selector
- Install gunner's control box
- Install gunner's seat
- Check manual accumulator nitrogen charge
- Fill hydraulic reservoir with fluid
- Bleed hydraulic system
- Install gunner's footrest plate

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Power Pack	FO-1	18
Main Accumulator	FO-1	19

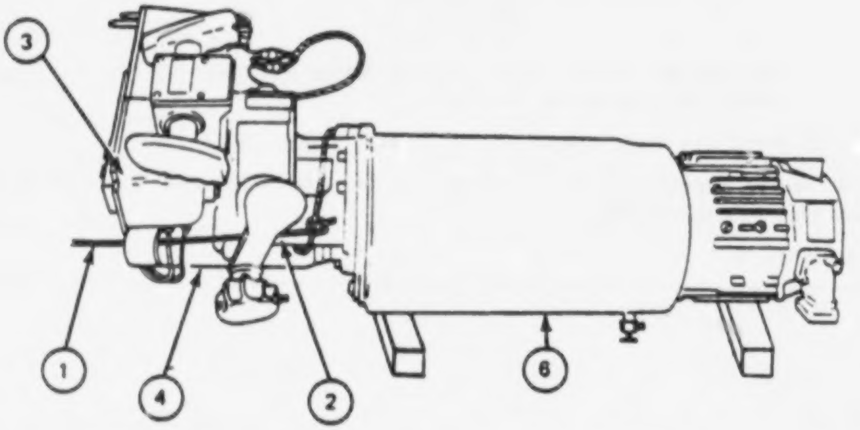
EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF

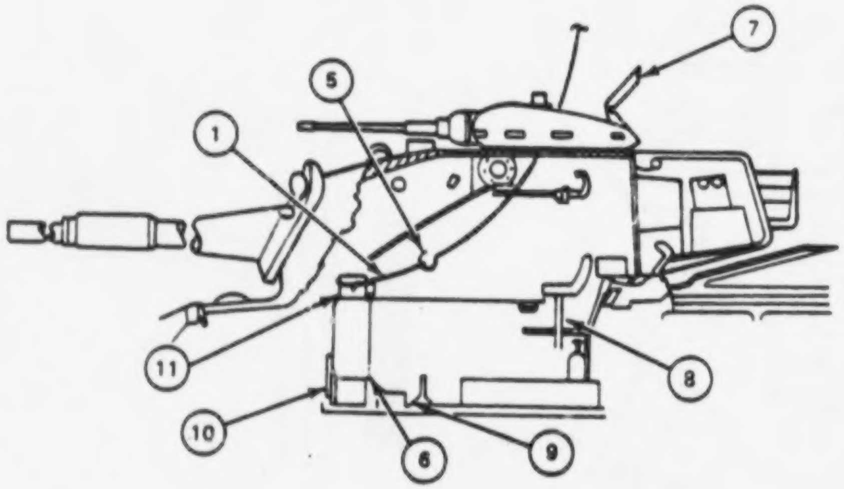
PRELIMINARY PROCEDURES: Assemble power pack (para 13-6)
Install gunner's control handle (para 13-82)
Install manual elevation pump (para 13-55)

13-4. POWER PACK INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
	WARNING Power pack (6) weighs approximately 280 pounds. Handle it with care so no one is hurt.
1.	Tie rope (1) around riser (2) under gunner's control (3). Run rope between accumulator (4) and riser (2).
2.	Tie rope (1) to hook (5) of hoist.
3.	Using hoist, lift power pack (6) and put over cupola hatch (7) opening.
4.	Soldier A, soldier B, soldier C and soldier D: Guide power pack (6) as it is lowered inside vehicle to turret floor near commander's seat (8).
	CAUTION Be careful while moving power pack (6) across floor of turret. Do not rest weight of power pack (6) on relay control box (9).
5.	Soldier A and Soldier B: With help of hoist, move power pack (6) over to mounting bracket (10) without resting weight of power pack on relay control box (9). Line up mounting bolt holes with brackets (10) and (11). GO TO FRAME 2

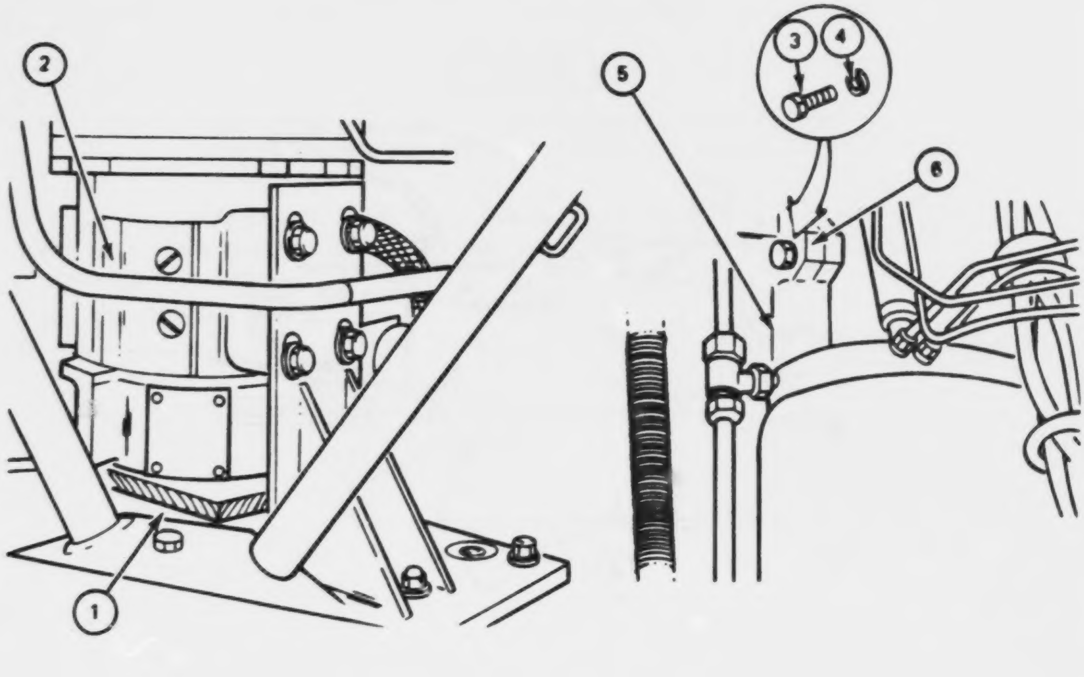




13-4. POWER PACK INSTALLATION PROCEDURE (CONT)

FRAME 2

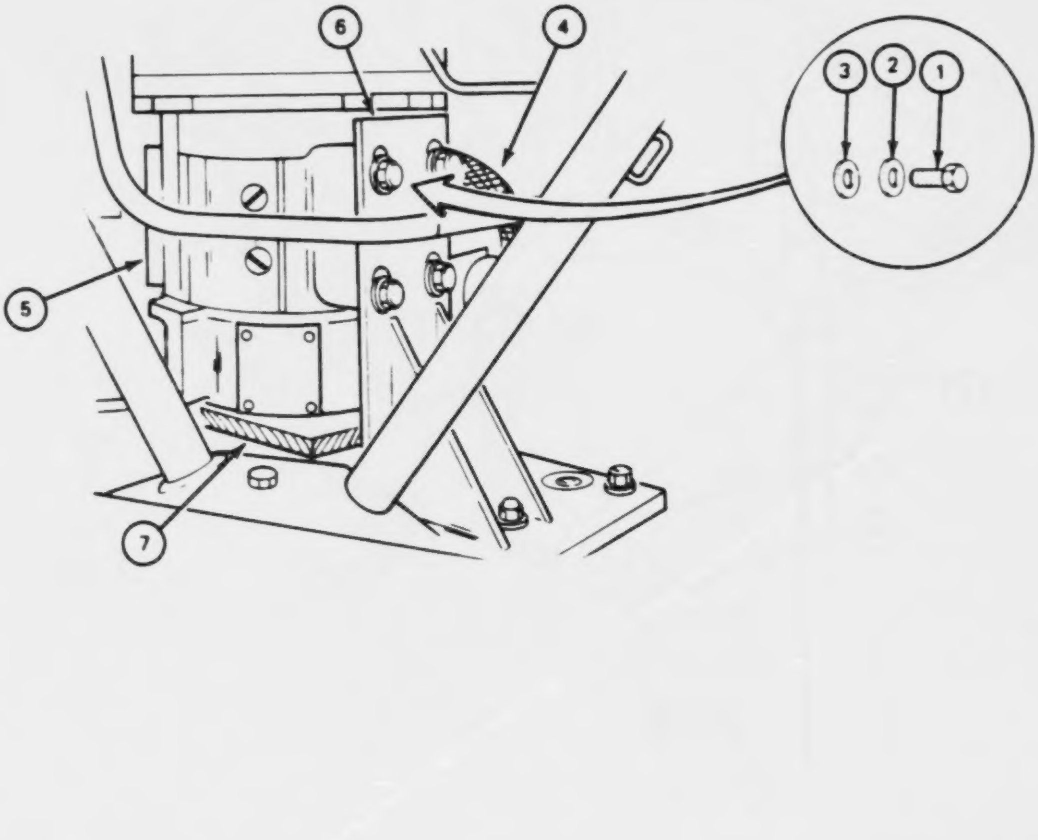
Step	Procedure
	CAUTION Do not put blocks under bearing hump at center of motor. Bearing can be damaged.
1.	Put blocks of wood (1) under motor (2) to support power pack.
2.	Using 3/4" socket wrench and extension, put in two screws (3) and two lockwashers (4) that attach riser (5) to bracket (6). GO TO FRAME 3



13-4. POWER PACK INSTALLATION PROCEDURE (CONT)

FRAME 3

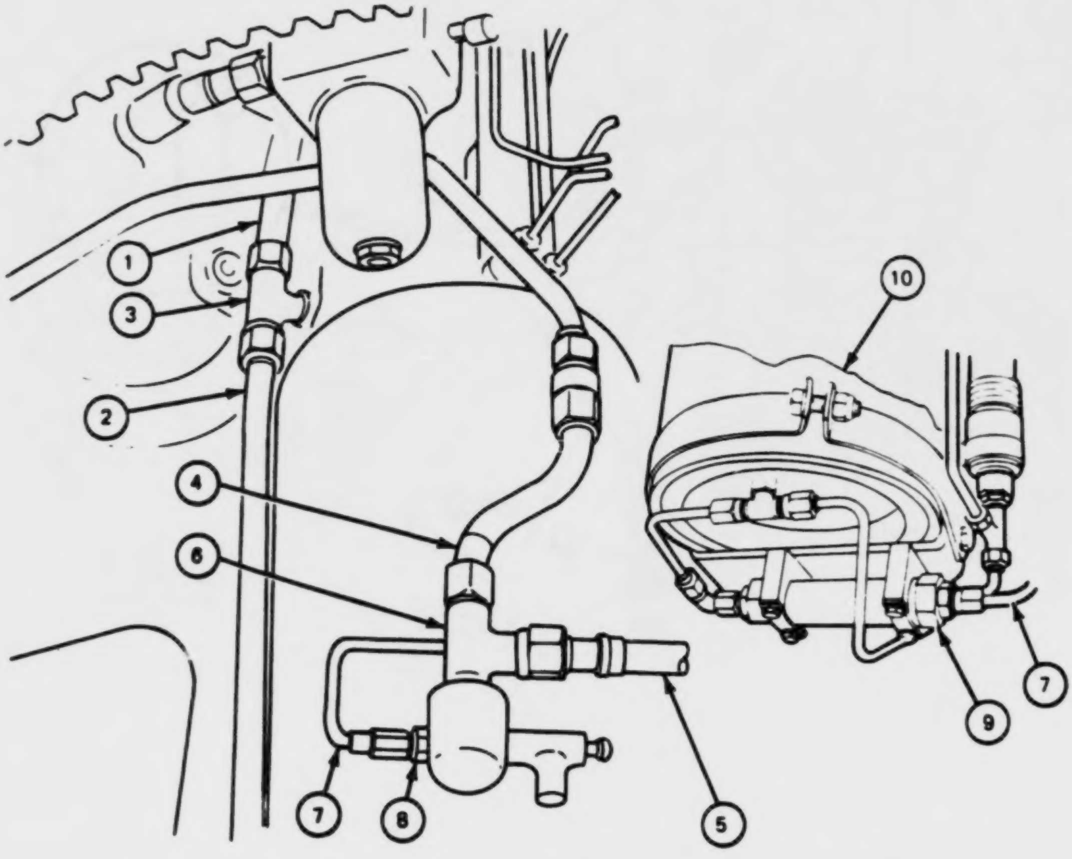
Step	Procedure
1.	Using 3/4" socket wrench, put in four screws (1), four lockwashers (2), four flat washers (3), and ground strap (4), that attach motor (5) to bracket (6).
2.	Remove blocks of wood (7).
3.	Remove rope from power pack.
	GO TO FRAME 4



13-4. POWER PACK INSTALLATION PROCEDURE (CONT)

FRAME 4

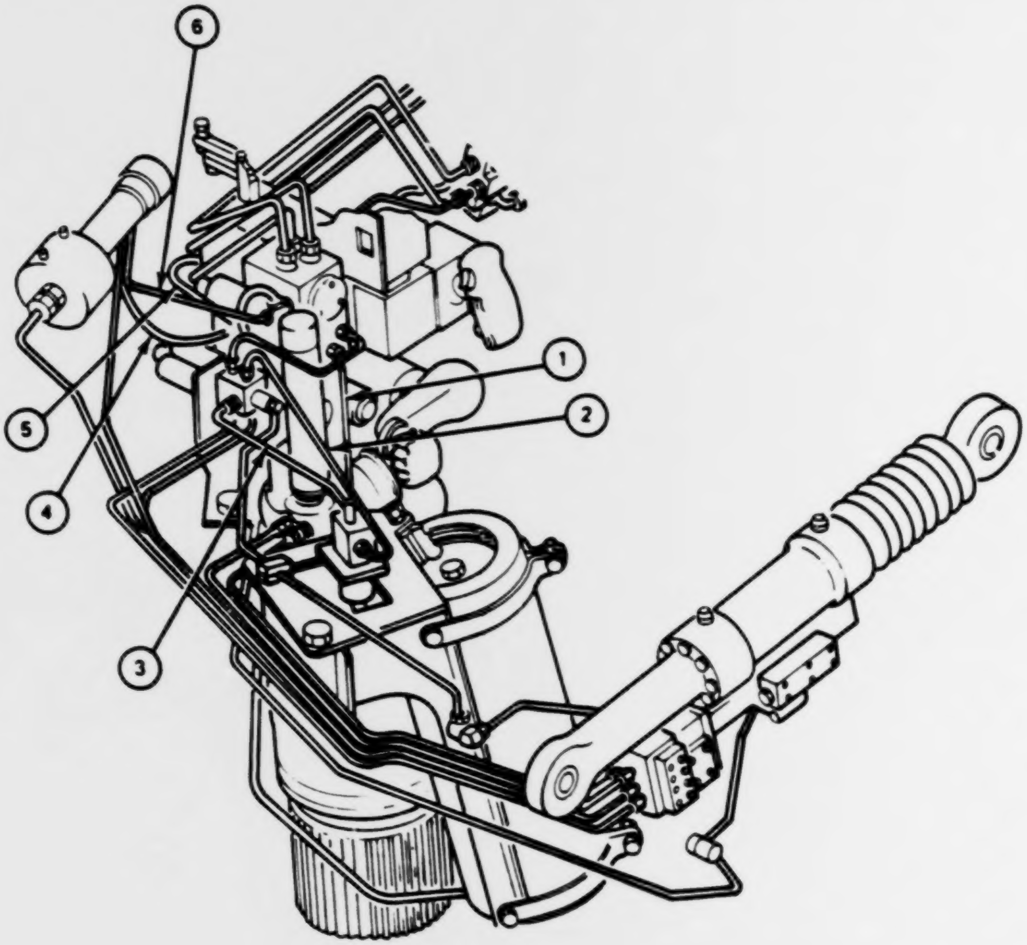
Step	Procedure
1.	Using 1" open end wrench, connect tubes (1) and (2) on riser tee (3).
2.	Using 1" open end wrench, connect tube (4) and (5) on drain tee (6).
3.	Using 9/16" open end wrench, connect tube (7) to drain (8) and relief valve (9) on main accumulator (10). GO TO FRAME 5



13-4. POWER PACK INSTALLATION PROCEDURE (CONT)

FRAME 5

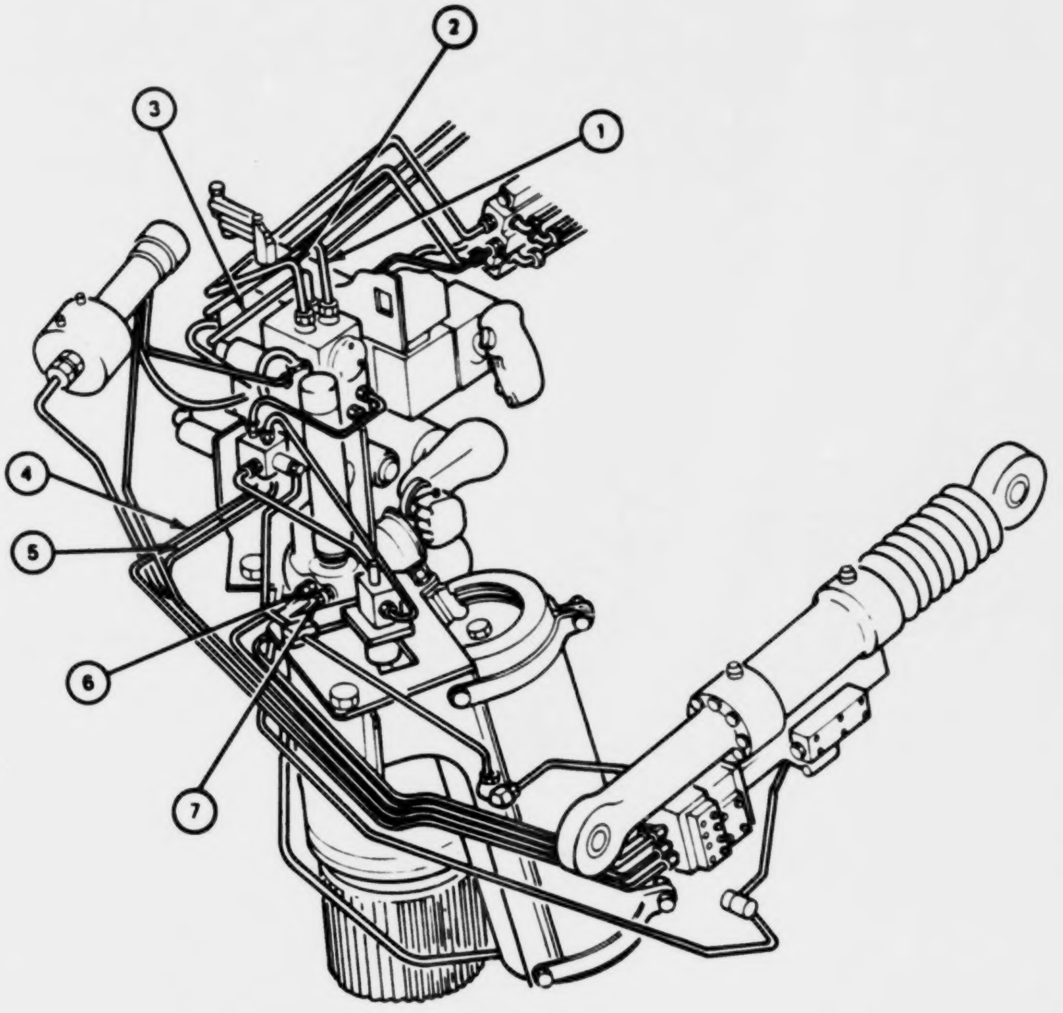
Step	Procedure
1.	Using 9/16" open end wrench, connect tubes (1) thru (6) to power pack. GO TO FRAME 6



13-4. POWER PACK INSTALLATION PROCEDURE (CONT)

FRAME 6

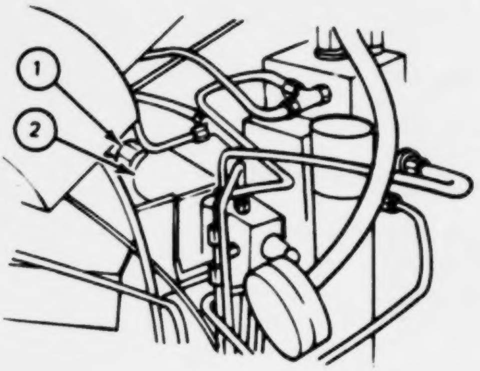
Step	Procedure
1.	Using 7/8'' open end wrench, connect two tubes (1) and (2) to power pack.
2.	Using 9/16'' open end wrench, connect five tubes (3) thru (7) to power pack.
	GO TO FRAME 7



13-4. POWER PACK INSTALLATION PROCEDURE (CONT)

FRAME 7

Step	Procedure
1.	Using fingers, connect electrical connector (1) on deck clearance valve solenoid (2) (JPG).
2.	Using pliers, connector electrical connector (3) under gunner's control housing (4) (JPG).
3.	Using spanner wrench, connect electrical connector (5) on power pack motor (6) (JPG).
4.	Using fingers, connect electrical connector (7) on top of gunner's control housing (4) (JPG).
	GO TO FRAME 8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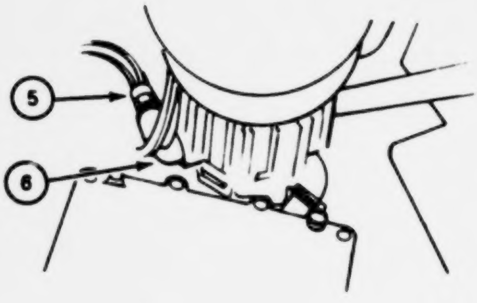
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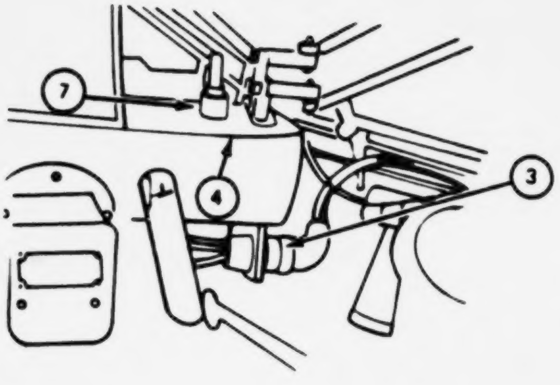
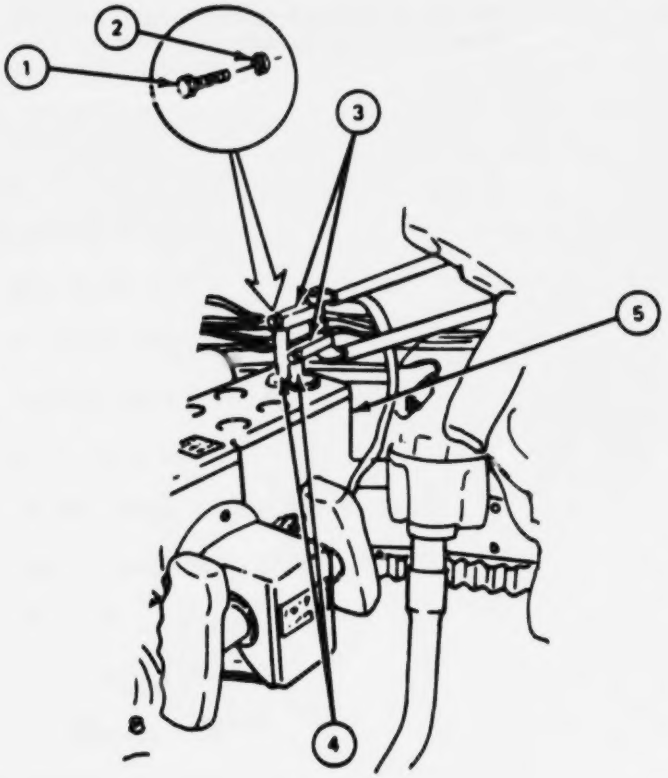


13-4. POWER PACK INSTALLATION PROCEDURE (CONT)

FRAME 8

Step	Procedure
1.	Using Allen wrench, install two screws (1) and two lockwashers (2) that attach two control levers (3) to control shafts (4) on gunner's control (5). **NOTE** Follow-on Maintenance Action Required: Install motor blower ducts (TM-20-2-3). Install gunner's footrest plate (TM-20-2-3). Install gunner's control box mounting bracket (TM-20-2-3). Install stabilization control selector (TM-20-2-3). Install gunner's control box (TM-20-2-3). Install gunner's seat (TM-20-2-3). Check manual accumulator nitrogen charge (TM-20-2-3). Check main accumulator nitrogen charge (TM-10). Fill hydraulic reservoir (TM-20-2-3). Bleed hydraulic system (TM-20-2-3). Traverse turret in power mode to make sure it operates properly (TM-10). END OF TASK



13-5. POWER PACK DISASSEMBLY PROCEDURE

PERSONNEL: One

REFERENCES: TM 9-2350-257-20-2-3 for procedures to:
Remove oil strainer
Remove manual elevation accumulator
Remove gunner's control

EQUIPMENT CONDITION: Gunner's control removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Remove power pack (para 13-3)
Remove manual elevation pump (para 13-54)

13-5. POWER PACK DISASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Remove manual elevation accumulator (TM-20-2-3).
2.	Remove shuttle valve (para 13-21).
3.	Remove oil strainer (TM-20-2-3).
4.	Remove hydraulic riser (para 13-14).
5.	Remove check valve (para 13-30).
6.	Remove drain tube (para 13-26).
7.	Remove oil filter (para 13-37).
8.	Remove electric drive motor (para 13-50).
9.	Remove oil reservoir (para 13-42).
10.	Remove hydraulic pump (para 13-47).
11.	Disassemble manual elevation accumulator (para 13-9).
12.	Disassemble shuttle valve (para 13-23).
13.	Disassemble hydraulic riser (para 13-16).
14.	Disassemble check valve (para 13-32).
15.	Disassemble oil filter (para 13-39).
16.	Disassemble oil reservoir (para 13-44).
	END OF TASK

13-6. POWER PACK ASSEMBLY PROCEDURE

PERSONNEL: One

REFERENCES: TM 9-2350-257-20-2-3 for procedures to:
Install manual elevation accumulator
Install oil strainer
Install gunner's control

FRAME 1

Step	Procedure
1.	Assemble oil reservoir (para 13-45).
2.	Assemble oil filter (para 13-40).
3.	Assemble check valve (para 13-33).
4.	Assembly hydraulic riser (para 13-17).
5.	Assemble shuttle valve (para 13-24).
6.	Assemble manual elevation accumulator (para 13-10).
7.	Install hydraulic pump (para 13-48).
8.	Install oil reservoir (para 13-43).
9.	Install electric drive motor (para 13-51).
	GO TO FRAME 2

13-6. POWER PACK ASSEMBLY PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Install oil filter (para 13-38).
2.	Install drain tube (para 13-27).
3.	Install check valve (para 13-31).
4.	Install hydraulic riser (para 13-15).
5.	Install oil strainer (TM-20-2-3).
6.	Install shuttle valve (para 13-22).
7.	Install manual elevation accumulator (TM-20-2-3).
	NOTE Follow-on Maintenance Action Required: Install manual elevation pump (para 13-55). Install gunner's control (TM-20-2-3).
	END OF TASK

Section 3. MANUAL ELEVATION ACCUMULATOR

13-7. MAINTENANCE PROCEDURES INDEX

Equipment Item	Test	Tasks Disassembly	Assembly
Manual Elevation Accumulator	13-8	13-9	13-10

13-8. MANUAL ELEVATION ACCUMULATOR TEST PROCEDURE

TEST EQUIPMENT: M3 oil pump
Pressure gauge (0-2000 psi)
Watch with sweep second hand
Suitable fittings, preformed packings and tools

TOOLS: 10" adjustable wrench
3/8" combination wrench
Drive pin punch (0.050" diameter)
3/4" combination wrench

SUPPLIES: Pan (two)
Wood dowel (3/16" diameter, 6" long)
Hydraulic fluid (item 10, App. A)
Lint-free cloths (item 21, App. A)

PERSONNEL: One

REFERENCES: TM 9-2350-257-20-2-3 for procedures to:
Charge manual elevation accumulator
Remove manual elevation accumulator
JPG for procedure to use M3 oil pump

EQUIPMENT CONDITION: Manual elevation accumulator removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Assemble manual elevation accumulator (para 13-10)

GENERAL INSTRUCTIONS:

WARNING

Hydraulic fluid under pressure can hurt or kill you. This test is done with high pressure hydraulic fluid. Follow procedure carefully.

NOTE

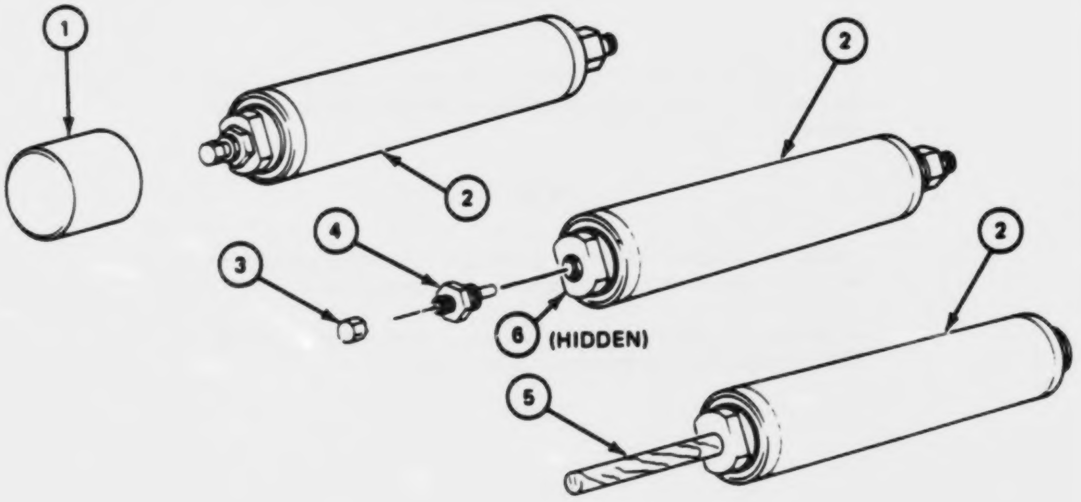
Suitable fittings, preformed packings, and tools should be used to connect test equipment to parts being tested.

If normal indication is not obtained, accumulator is bad. Disassemble bad accumulator (para 13-9).

13-8. MANUAL ELEVATION ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 1

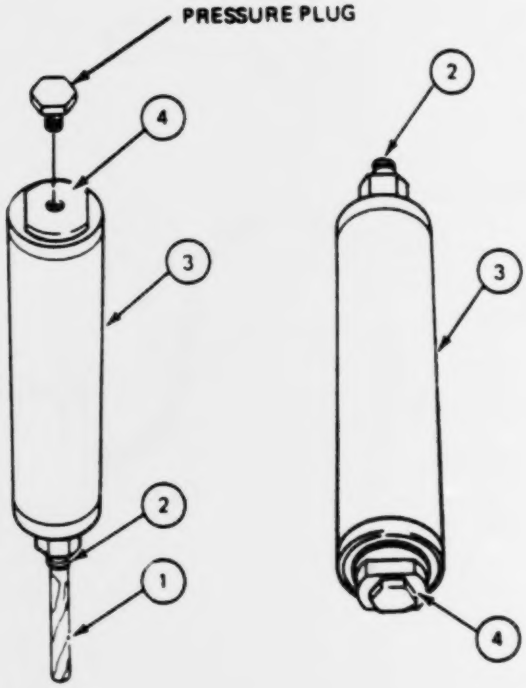
Step	Procedure
1.	Remove end cap (1) from accumulator (2).
2.	Using 3/8" combination wrench, remove valve cap (3) from charging valve (4).
	WARNING Make sure accumulator gas chamber is not pressurized before removing charging valve (4). Removal of valve under pressure can hurt or kill you.
3.	Using punch, press center pin of charging valve (4) until valve is open. If accumulator gas chamber is pressurized, gas can be heard escaping from valve. Bleed gas from valve slowly until it stops. Remove punch.
4.	Using adjustable wrench, and 3/4" combination wrench, remove charging valve (4) from accumulator (2).
5.	Using wood dowel (5), push accumulator piston (6) to about two inches from either end of accumulator. Remove wood dowel. GO TO FRAME 2



13-8. MANUAL ELEVATION ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 2

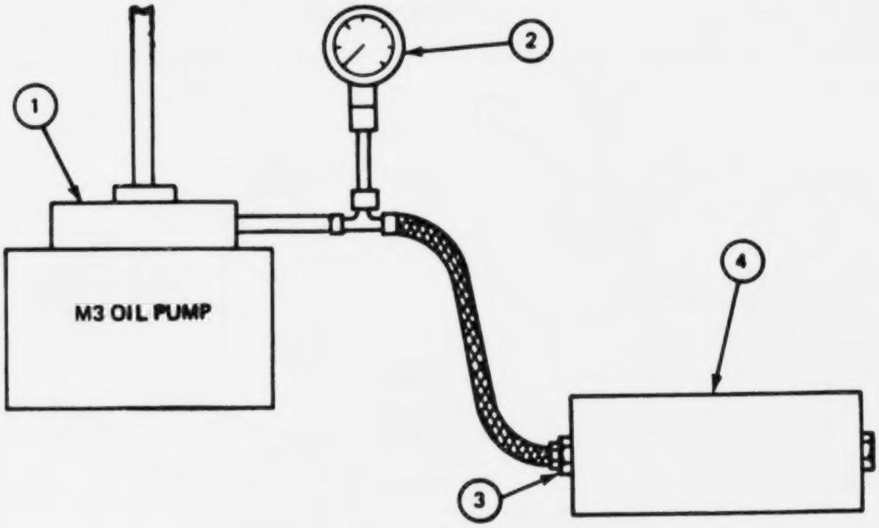
Step	Procedure
1.	Put wood dowel (1) in port (2) of accumulator (3) until it touches accumulator piston.
2.	Turn accumulator (3) until charging valve port (4) is on top.
3.	Holding wood dowel (1) against piston, fill gas chamber of accumulator (3) with hydraulic fluid through port (4).
4.	When chamber is full, plug port (4).
5.	Remove wood dowel (1).
6.	Tighten pressure plug.
7.	Turn accumulator (3) until oil port (2) is on top.
8.	Fill oil chamber with hydraulic fluid through port (2).
	GO TO FRAME 3



13-8. MANUAL ELEVATION ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 3

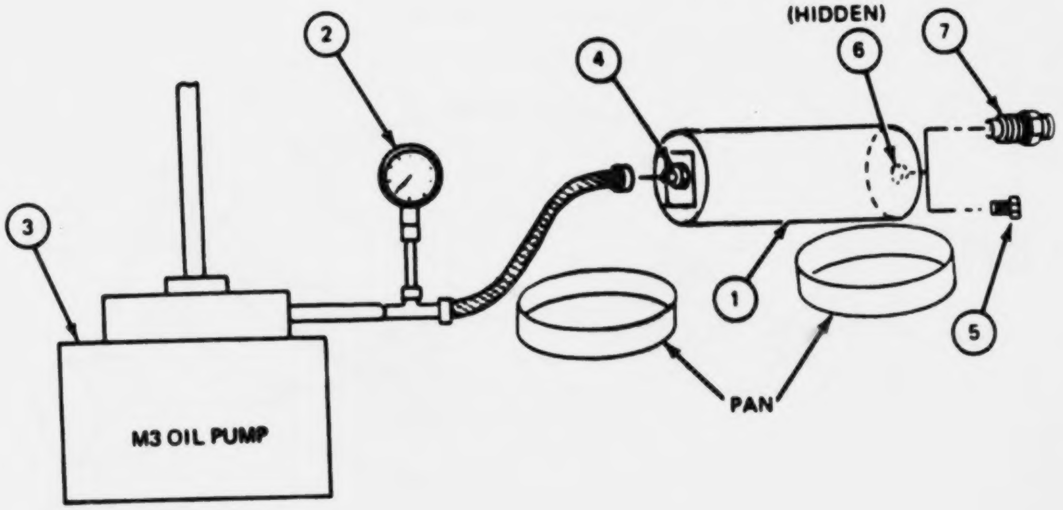
Step	Procedure
1.	Assemble M3 oil pump (1).
2.	Connect M3 oil pump (1) and pressure gauge (2) to oil port (3) of accumulator (4).
3.	Using lint-free cloths, wipe all hydraulic fluid from outside of accumulator (4).
4.	Operate pump until pressure gauge (2) reads between 800 and 850 psi (JPG).
	NOTE No hydraulic fluid should leak out of accumulator.
5.	Using watch, check accumulator (4) for leaks for five minutes. GO TO FRAME 4



13-8. MANUAL ELEVATION ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 4

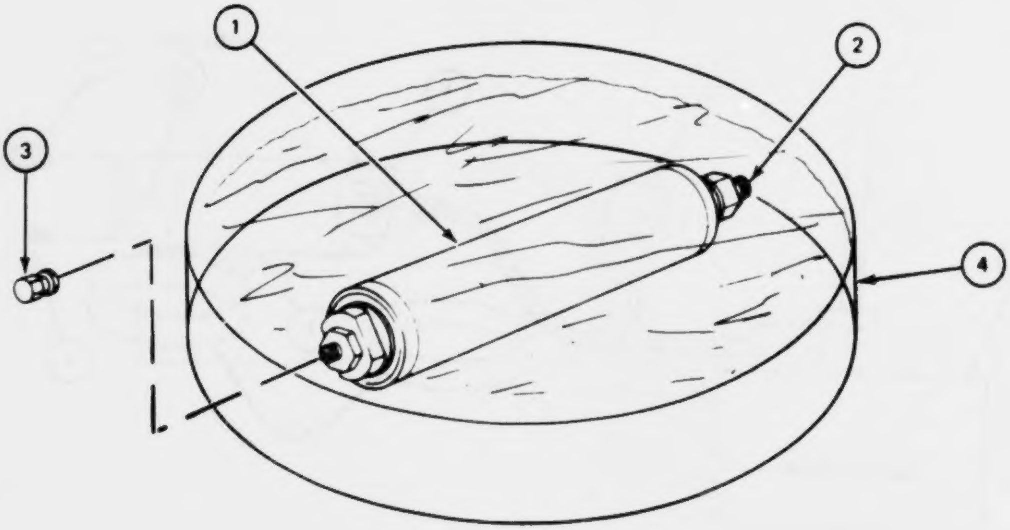
Step	Procedure
1.	Slowly lower hydraulic pressure in accumulator (1) until pressure gauge (2) reads 0 psi (JPG).
	NOTE Use pan to catch hydraulic fluid.
2.	Disconnect M3 oil pump (3) from accumulator oil port (4). Let hydraulic fluid drain into pan.
3.	Using adjustable wrench, remove pressure plug (5) from charging valve port (6).
4.	Pour hydraulic fluid out of accumulator gas chamber through charging valve port (6). Let hydraulic fluid drip from port for at least 10 minutes.
5.	Using adjustable wrench, and 3/4'' combination wrench, install charging valve (7) in charging valve port (6).
	GO TO FRAME 5



13-8. MANUAL ELEVATION ACCUMULATOR TEST PROCEDURE (CONT)

FRAME 5

Step	Procedure
1.	Charge accumulator (1) to about 100 psi with nitrogen gas (TM-20-2-3).
2.	With oil port (2) open and gas charging valve cap (3) removed, put accumulator (1) in pan (4).
3.	Cover accumulator (1) with hydraulic fluid.
	NOTE No bubbles should come out of accumulator during test. Bubbles mean accumulator is leaking.
4.	Using watch, check accumulator for bubbles (leaks) for 10 minutes.
	GO TO FRAME 6



13-8. MANUAL ELEVATION ACCUMULATOR TEST PROCEDURE (CONT)

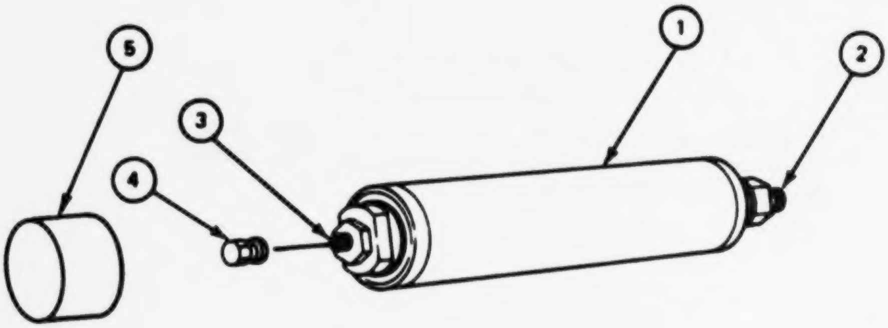
FRAME 6

Step	Procedure
1.	Take accumulator (1) out of pan.
2.	Pour hydraulic fluid out of oil port (2) into pan.
3.	Using punch, press down on middle of charging valve (3) until all nitrogen gas is out of accumulator (1).
4.	Let accumulator drip dry for at least 10 minutes.
5.	Using 3/8" combination wrench, install charging valve cap (4).
6.	Install end cap.
7.	Disassemble M3 oil pump.

NOTE

If normal indication was obtained in Frames 1 through 5, accumulator is good.

END OF TASK



13-9. MANUAL ELEVATION ACCUMULATOR DISASSEMBLY PROCEDURE

TOOLS: 3/8" combination wrench
3/4" combination wrench
1-1/8" combination wrench
Drive pin punch (0.050" diameter)
Valve core tool
1/8" flat tip screwdriver
Wood dowel 1/2" diameter, 10" long
O-ring extractor kit
Vise with brass caps
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Lint-free cloths (item 21, App. A)
Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: TM 9-2350-257-20-2-3 for procedure to remove manual elevation accumulator
JPG for procedures to:
Remove preformed packings
Remove retaining rings
Clean parts
Inspect and repair parts

EQUIPMENT CONDITION: Manual elevation accumulator removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Test manual elevation accumulator (para 13-8)

GENERAL INSTRUCTIONS:

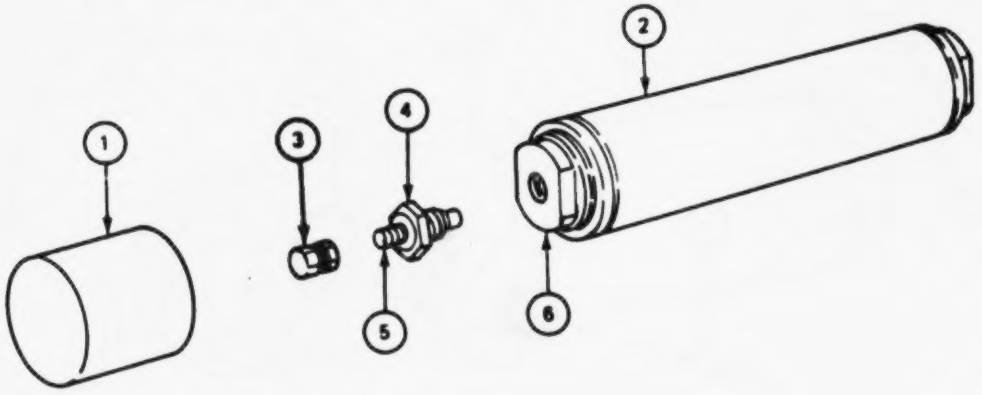
CAUTION

Hydraulic parts must be protected from dirt during disassembly. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

13-9. MANUAL ELEVATION ACCUMULATOR DISASSEMBLY PROCEDURE (CONT)

FRAME 1

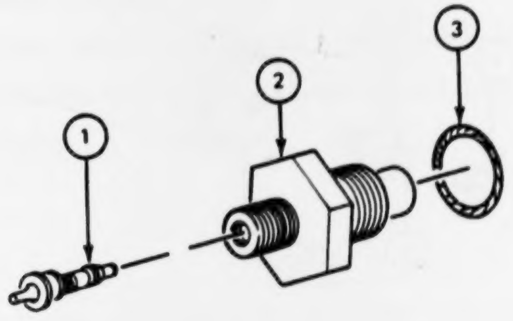
Step	Procedure
1.	Using hands, remove cap (1) from cylinder (2).
2.	Using 3/8'' wrench, remove valve cap (3) from valve body (4).
3.	Using punch, press valve core (5) in valve body (4) to release any nitrogen pressure.
4.	Using 1-1/8'' wrench on fitting (6) and 3/4'' wrench on valve body (4), remove valve body from fitting. GO TO FRAME 2



13-9. MANUAL ELEVATION ACCUMULATOR DISASSEMBLY PROCEDURE (CONT)

FRAME 2

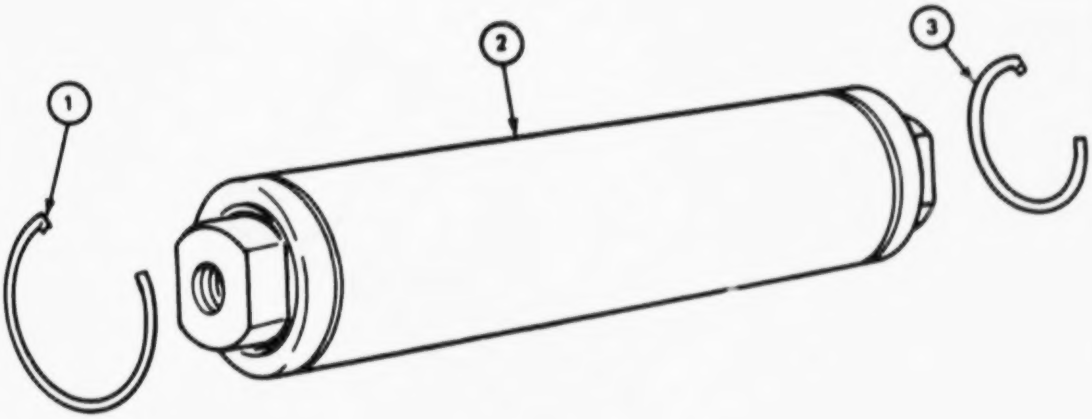
Step	Procedure
1.	Using valve core tool, remove valve core (1) from valve body (2).
2.	Using O-ring extractor tool, remove preformed packing (3) from valve body (2) (JPG). Throw preformed packing away. GO TO FRAME 3



13-9. MANUAL ELEVATION ACCUMULATOR DISASSEMBLY PROCEDURE (CONT)

FRAME 3

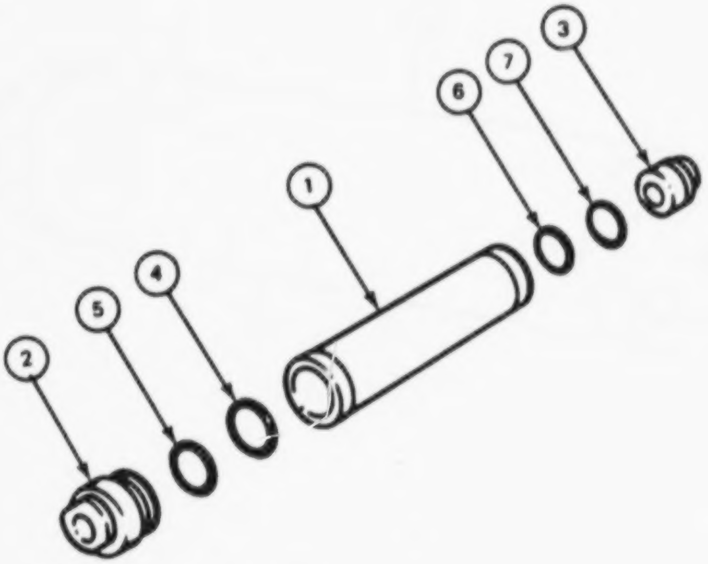
Step	Procedure
1.	Using punch and screwdriver, remove retaining ring (1) from cylinder (2) (JPG).
2.	Using punch and screwdriver, remove retaining ring (3) from cylinder (2) (JPG). GO TO FRAME 4



13-9. MANUAL ELEVATION ACCUMULATOR DISASSEMBLY PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Put cylinder (1) in vise.
2.	Using 1-1/8" wrench on fitting (2), remove fitting from cylinder (1).
3.	Using 1-1/8" wrench on fitting (3), remove fitting from cylinder (1).
4.	Using O-ring extractor tool, remove preformed packing (4) and backup ring (5) from fitting (2) (JPG). Throw backup ring and preformed packing away.
5.	Using O-ring extractor tool, remove preformed packing (6) and backup ring (7) from fitting (3) (JPG). Throw backup ring and preformed packing away. GO TO FRAME 5



13-9. MANUAL ELEVATION ACCUMULATOR DISASSEMBLY PROCEDURE (CONT)

FRAME 5

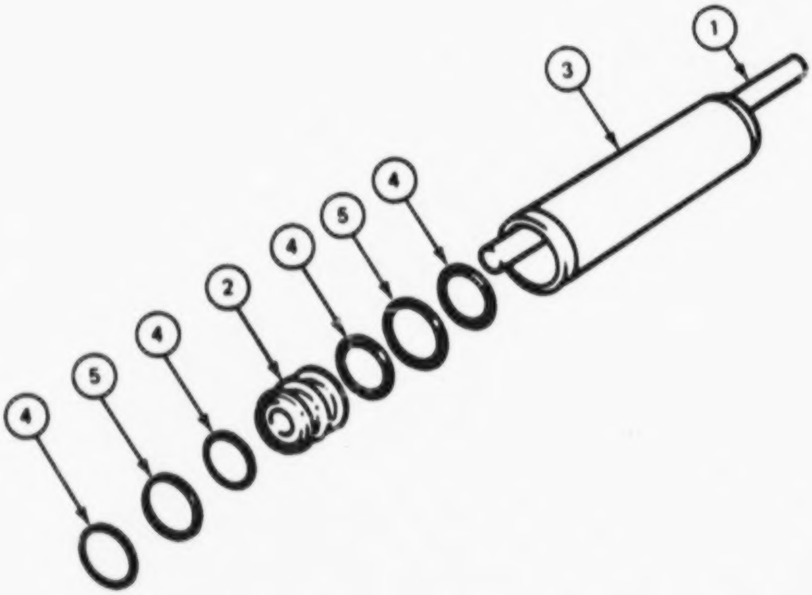
Step	Procedure
1.	Using wood dowel (1), push piston (2) from cylinder (3).
2.	Using O-ring extractor tool, remove two backup rings (4) and one preformed packing (5) from each end of piston (2) (JPG). Throw backup rings and preformed packings away.
3.	Remove cylinder (3) from vise.

NOTE

Follow-on Maintenance Action Required:

Clean all parts (JPG).
Inspect and repair all parts (JPG).

END OF TASK



13-10. MANUAL ELEVATION ACCUMULATOR ASSEMBLY PROCEDURE

TOOLS: 3/8" combination wrench
3/4" combination wrench
1-1/8" combination wrench
Valve core tool
O-ring extractor kit
Vise with brass caps

SUPPLIES: Accumulator assembly parts kit (5703505)
Hydraulic fluid (item 10, App. A)

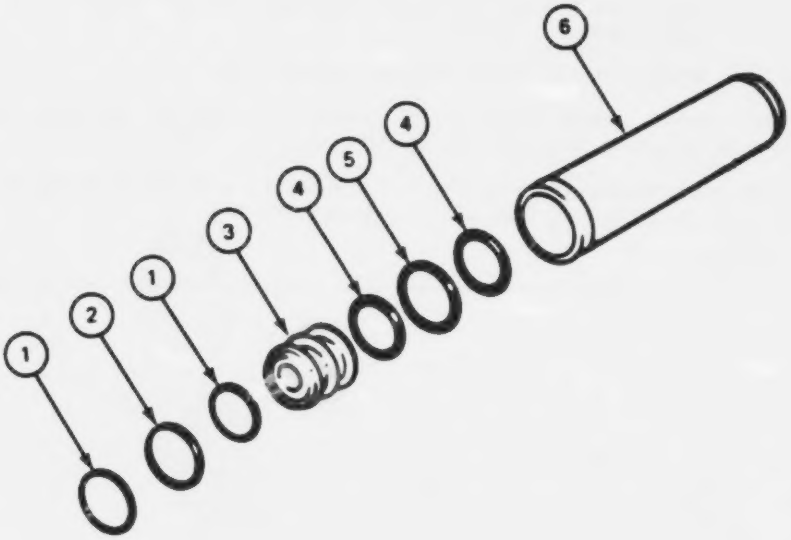
PERSONNEL: One

REFERENCES: JPG for procedures to:
Install preformed packing
Install retaining ring

13-10. MANUAL ELEVATION ACCUMULATOR ASSEMBLY PROCEDURE (CONT)

FRAME 1

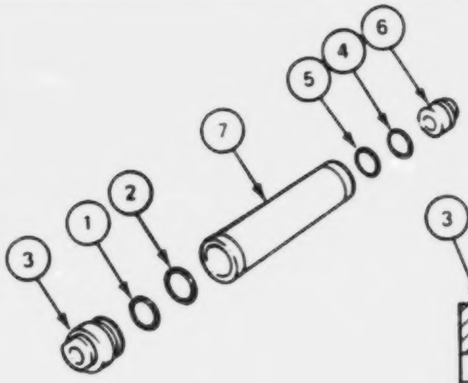
Step	Procedure
1.	Using O-ring extractor tool, put two new backup rings (1) and new preformed packing (2) on end of piston (3) (JPG).
2.	Using O-ring extractor tool, put two new backup rings (4) and new preformed packing (5) on other end of piston (3) (JPG).
3.	Check to make sure two backup rings (1), two backup rings (4), preformed packing (2), and preformed packing (5) are all the way in grooves on piston (3).
4.	Coat piston (3) and inside of cylinder (6) with hydraulic fluid.
5.	Carefully put piston (3) in cylinder (6). GO TO FRAME 2

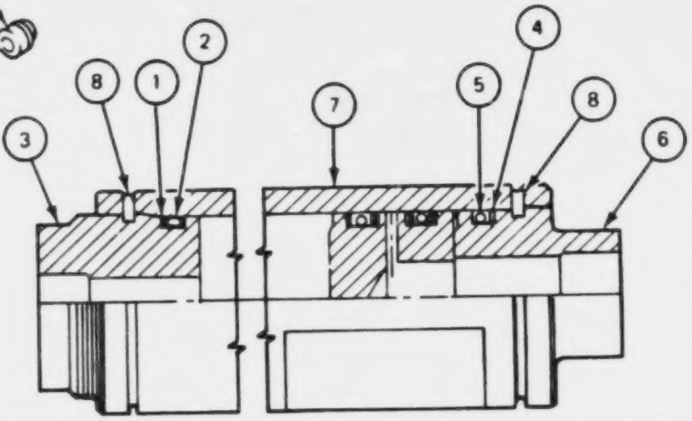


13-10. MANUAL ELEVATION ACCUMULATOR ASSEMBLY PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Using O-ring extractor tool, put new backup ring (1) and new preformed packing (2) on fitting (3) (JPG).
2.	Using O-ring extractor tool, put new backup ring (4) and new preformed packing (5) on fitting (6) (JPG).
3.	Check to make sure backup ring (1) and preformed packing (2) are all the way in grooves on fitting (3). Check to make sure backup ring (4) and preformed packing (5) are all the way in grooves on fitting (6).
4.	Coat fitting (3), fitting (6), and inside of cylinder (7) with hydraulic fluid.
5.	Put cylinder (7) in vise.
	NOTE Fitting (3) has smaller threaded hole thru middle. Be sure to put fitting (3) into end of cylinder (7) facing flat end of piston.
6.	Carefully push fitting (3) and fitting (6) into cylinder (7).
7.	Using 1-1/8" wrench, attach fitting (3) to cylinder (7). Line up retaining ring groove in fitting (3) with retaining ring hole (8) in cylinder (7).
8.	Using 1-1/8" wrench, attach fitting (6) to cylinder (7). Line up retaining ring groove in fitting (6) with retaining ring hole (8) in cylinder (7).
	GO TO FRAME 3

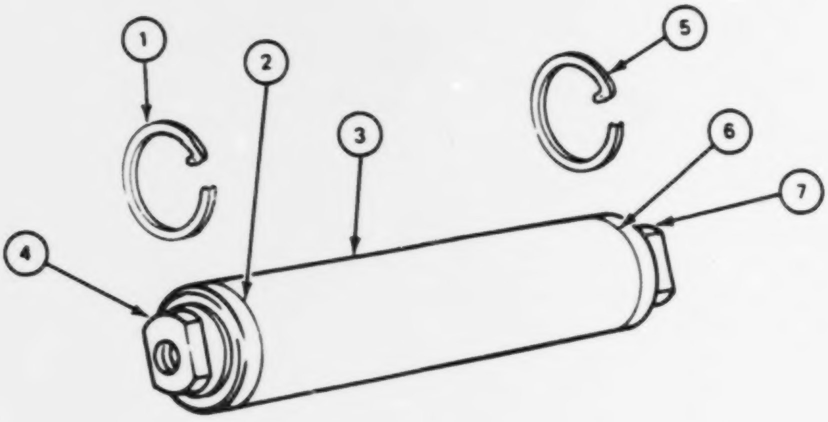




13-10. MANUAL ELEVATION ACCUMULATOR ASSEMBLY PROCEDURE (CONT)

FRAME 3

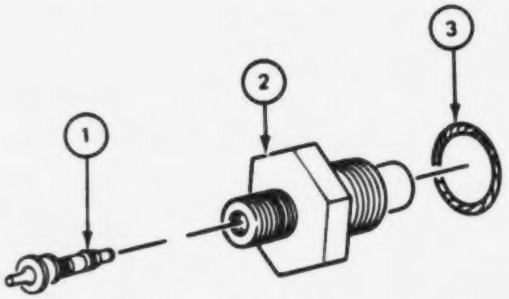
Step	Procedure
1.	Put bent end of retaining ring (1) in hole in groove (2).
2.	Slide free end of retaining ring (1) around cylinder (3) and into groove (2).
3.	Check to be sure bent end of retaining ring (1) is all the way in groove (2). If not, screw fitting (4) in or out as needed to make retaining ring (1) fit in groove (2).
4.	Put bent end of retaining ring (5) in hole in groove (6).
5.	Slide free end of retaining ring (5) around cylinder (3) and into groove (6).
6.	Check to be sure bent end of retaining ring (1) is all the way in groove (6). If not, screw fitting (7) in or out as needed to make retaining ring (5) fit in groove (6).
7.	Remove cylinder (3) from vise.
	GO TO FRAME 4



13-10. MANUAL ELEVATION ACCUMULATOR ASSEMBLY PROCEDURE (CONT)

FRAME 4

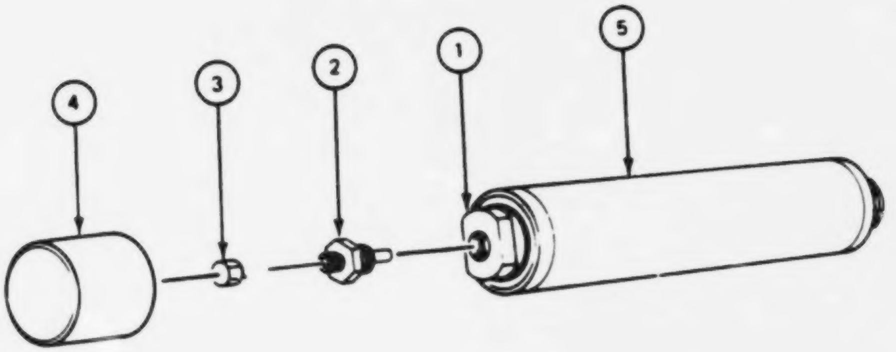
Step	Procedure
1.	Using valve core tool, put valve core (1) in valve body (2).
2.	Coat new preformed packing (3) with hydraulic fluid.
3.	Using O-ring extractor tool, put preformed packing (3) on valve body (2) (JPG). GO TO FRAME 5



13-10. MANUAL ELEVATION ACCUMULATOR ASSEMBLY PROCEDURE (CONT)

FRAME 5

Step	Procedure
1.	Using 1-1/8" wrench to hold fitting (1) and 3/4" wrench to turn valve body (2), put valve body (2) in fitting (1).
2.	Using 3/8" wrench, put valve cap (3) on valve body (2).
3.	Put cap (4) on cylinder (5). **NOTE** Follow-on Maintenance Action Required: Test manual elevation accumulator assembly (para 13-8). END OF TASK



Section 4. HYDRAULIC RISER

13-11. MAINTENANCE PROCEDURES INDEX

	Tasks						
Equipment Item	Inspection	Test	Adjustment	Removal	Installation	Disassembly	Assembly
Hydraulic Riser	13-12	13-13	13-13	13-14	13-15	13-16	13-17

13-12. HYDRAULIC RISER INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Disassemble hydraulic riser (para 13-16)

GENERAL INSTRUCTIONS:

NOTE

If part is bad, order repair part or next higher assembly as required.

13-12. HYDRAULIC RISER INSPECTION PROCEDURE (CONT)

FRAME 1

Step	Procedure
	SUPPORT SHOP WORK
1.	Take parts to shop where inspection and spring testing equipment is available.
2.	Check dimensions and spring loads as follows:

NOTE

Spool (D) and sleeve (E) are matched set. Keep them together at all times.

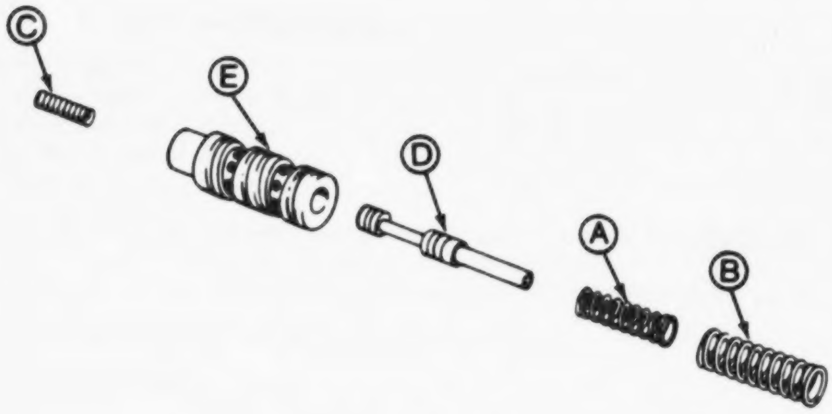
Reference P	Point of Measurement	Size and Load
A	Spring: Free length	2.8550 to 2.8950"
	Load required to compress to 1.710"	81 to 99 pounds
	Load required to compress to 1.920"	66.5 to 80.5 pounds
B	Spring: Free length	2.0040 to 2.9740"
	Load required to compress to 1.82"	120.5 to 136.5 pounds
	Load required to compress to 1.66"	137 to 155 pounds
C	Spring: Free length	1.3860 to 1.4260"
	Load required to compress to 0.880"	25 to 31 pounds
	Load required to compress to 0.980"	15 to 19 pounds
D	Outside diameter of spool	0.5615 to 0.5620"
E	Inside diameter of spool sleeve	0.5623 to 0.5628"

NOTE

Tag parts that are out of tolerance.

3. After support shop work, return parts to turret shop.

END OF TASK


C
E
D
A
B

13-13. HYDRAULIC RISER TEST AND ADJUSTMENT PROCEDURE

TOOLS: 9/16" combination wrench

SUPPLIES:
Rags (item 21, App. A)
Protective cap
Paper
Pencil

PERSONNEL: One

REFERENCES: TM 9-2350-257-20-2-3 for procedure to lower hydraulic system pressure

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Turret Traverse Lock	FO-4	6
Gunner's Control Box	FO-1	2
Power Pack	FO-1	18

EQUIPMENT CONDITION:
Driver's master control panel **MASTER BATTERY** switch set to **OFF**
Turret traverse lock set to LOCKED
Gunner's control box **ELEV/TRAV** power switch set to **OFF**

PRELIMINARY PROCEDURES: Install hydraulic riser (para 13-15)

GENERAL INSTRUCTIONS:

CAUTION

Keep dirt from getting in tubes or parts. Dirt can damage equipment.

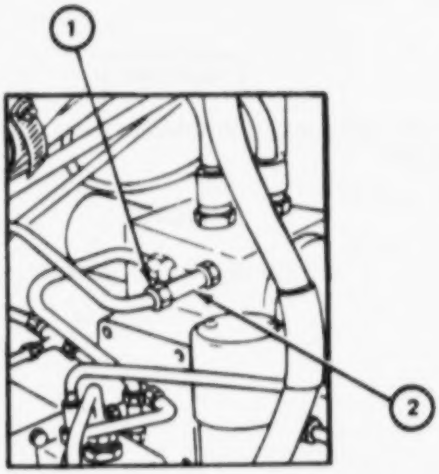
NOTE

Use rags for oil spillage.

13-13. HYDRAULIC RISER TEST AND ADJUSTMENT PROCEDURE (CONT)

FRAME 1

Step	Procedure
	WARNING **Hydraulic pressure must be lowered to 0 psi before removal of any hydraulic tubes or parts. Hydraulic fluid under pressure can hurt you.**
1.	Lower hydraulic system pressure to 0 psi (TM-20-2-3).
2.	Using 9/16'' combination wrench, disconnect tube (1) from tee (2).
3.	Put protective cap in tube (1).
4.	Put test pressure gauge on tee (2).
	GO TO FRAME 2



13-13. HYDRAULIC RISER TEST AND ADJUSTMENT PROCEDURE (CONT)

FRAME 2

Step	Procedure	Normal Indication
1.	Set driver's master control panel MASTER BATTERY switch to ON.	MASTER BATTERY lamp lights
2.	Set gunner's control panel ELEV/TRAV POWER switch to ON.	ELEV/TRAV POWER lamp lights. Test pressure gauge should show pressure increase and then indicate between 925 and 975 psi.
3.	Using paper and pencil, write down test pressure gauge reading.	. . .
4.	Set gunner's control box ELEV/TRAV POWER switch to OFF.	ELEV/TRAV power lamp goes out.
5.	Set driver's master control panel MASTER BATTERY switch to OFF.	MASTER BATTERY lamp goes out.
6.	Lower hydraulic system pressure to 0 psi (TM-20-2-3).	. . .

NOTE

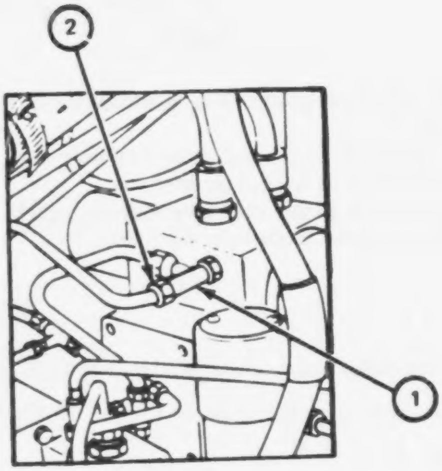
If test pressure gauge has normal indication, go to FRAME 3.
If test pressure gauge indicates less than 925 psi, shims must be added to hydraulic riser.
If test pressure gauge indicates more than 975 psi, shims must be removed from hydraulic riser.

Step	Procedure
7.	Remove shims from hydraulic riser (para 13-16, FRAME 1).
8.	Install proper shims in hydraulic riser (para 13-17, FRAMES 4 and 5).
9.	Repeat steps 1 through 6.
	GO TO FRAME 3

13-13. HYDRAULIC RISER TEST AND ADJUSTMENT PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Remove test presure gauge from tee (1).
2.	Remove protective cap from tube (2).
3.	Using 9/16¨ combination wrench, connect tube (2) to tee (1).
	END OF TASK



13-14. HYDRAULIC RISER REMOVAL PROCEDURE

TOOLS:
- 5/16" socket head screw key (Allen wrench)
- 9/16" open end wrench
- 13/16" open end wrench
- 1" open end wrench
- 3/4" socket (1/2" drive)
- 6" extention (1/2" drive)
- 1/2" drive ratchet
- O-ring extractor kit

SUPPLIES:
- Lint-free cloths (item 21, App. A)
- Caps
- Plugs

PERSONNEL: One

REFERENCES: TM 9-2350-257-20-2-3 for procedures to:
- Remove gunner's control
- Remove manual elevation accumulator

JPG for procedures to:
- Tag hydraulic tubes
- Remove preformed packings

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Power Pack	FO-1	18

EQUIPMENT CONDITION:
- Driver's master control panel MASTER BATTERY switch set to OFF
- Manual elevation accumulator removed (TM-20-2-3)
- Gunner's control removed (TM-20-2-3)

PRELIMINARY PROCEDURES:
- Remove shuttle valve (para 13-21) (See General Instruction Note)
- Remove manual elevation pump (para 13-54)

GENERAL INSTRUCTIONS:

CAUTION

Hydraulic parts must be protected from dirt after removal. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

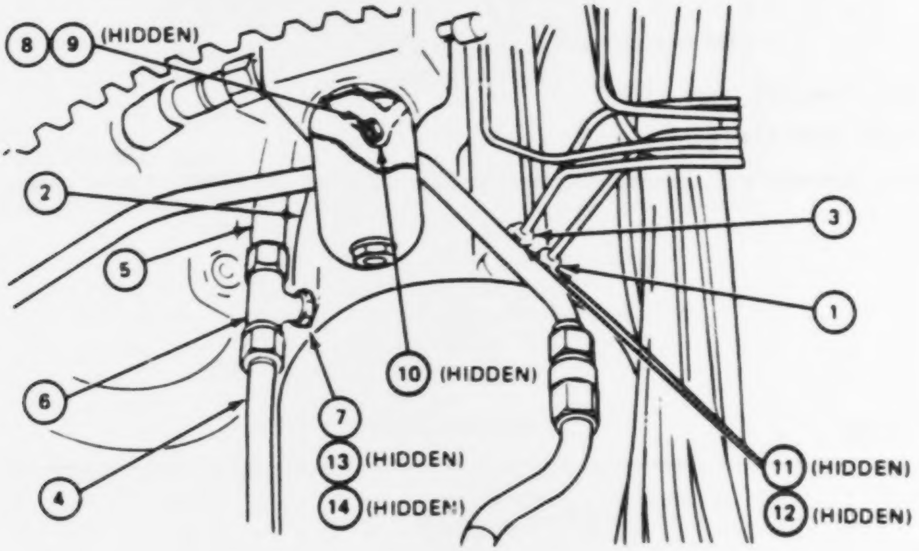
NOTE

If removing hydraulic riser only to service hydraulic filter, shuttle valve does not need to be removed.

13-14. HYDRAULIC RISER REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
	NOTE If removing hydraulic riser to service hydraulic filter, only disconnect tubes in steps 1 thru 3, omit step 4 and go to step 5.
1.	Using 9/16": and 13/16" open end wrenches, disconnect tube (1) from riser (2) port MD.
2.	Using 9/16" and 13/16" open end wrenches, disconnect tube (3) from riser (2) port ME.
3.	Using 1" open end wrench, disconnect tubes (4) and (5) from riser (2) port HP tee (6).
4.	Using 1" open end wrench, loosen nut (7) and remove tee (6).
5.	Using 3/4" socket with extension, remove two screws (8) and two lockwashers (9) attaching riser (2) to bracket (10).
	NOTE Do steps 6 through 8 if riser (2) is bad.
6.	Using 13/16" open end wrench, remove two nipples (11) from riser (2) port MD and port ME.
7.	Using O-ring extractor tool, remove two preformed packing (12) from two nipples (11) (TPG). Throw preformed packing away.
8.	Using O-ring extractor tool, remove preformed packing (13) and non-metallic washer (14) from tee (6).
	GO TO FRAME 2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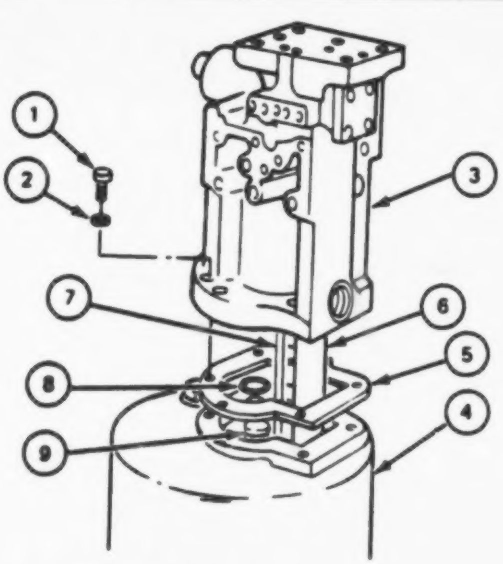
13-14. HYDRAULIC RISER REMOVAL PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Using Allen wrench, remove six screws (1) and six lockwashers (2) attaching riser (3) to reservoir (4).
2.	Remove riser (3) from reservoir (4).
3.	Remove gasket (5) from reservoir (4). Throw away gasket.
	NOTE Do steps 4 and 5 if riser (3) is bad.
4.	Remove drain tube (6) (para 13-26).
5.	Remove check valve (7) (para 13-30).
6.	Using O-ring extractor tool, remove packing (8) from oil filter (9) (JPG). Throw away packing.
	END OF TASK



13-15. HYDRAULIC RISER INSTALLATION PROCEDURE

TOOLS:
- 3/4" socket (1/2" drive)
- 1/2" drive ratchet
- 6" extension (1/2" drive)
- 9/16" open end wrench
- 13/16" open end wrench
- 1" open end wrench
- 5/16" socket head screw key (Allen wrench)
- 5/16" hex head socket (3/8" drive)
- 3/8" drive torque wrench (0-600 inch-pounds)
- O-ring extractor kit

SUPPLIES:
- Control power pack parts kit (5703523)
- Hydraulic fluid (item 10, App. A)
- Preformed packing (MS 28778-6) (two)
- Preformed packing (MS 28778-10)
- Non-metallic washer (MS 28777-10)

PERSONNEL: One

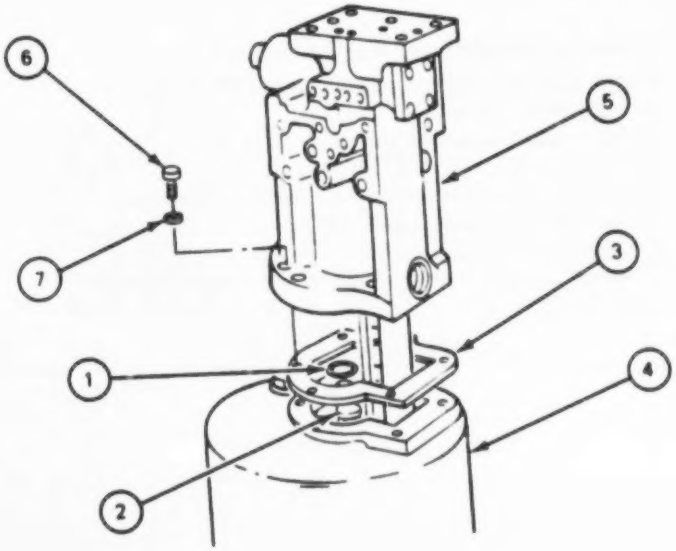
REFERENCES:
- TM 9-2350-257-10 for procedure to traverse turret
- TM 9-2350-257-20-2-3 for procedures to:
  - Install manual elevation accumulator
  - Install gunner's control
  - Pressurize manual elevation accumulator
  - Bleed hydraulic system
- JPG for procedures to:
  - Use torque wrench
  - Install preformed packing

PRELIMINARY PROCEDURES:
- Install oil filter (para 13-38)
- Install drain tube on hydraulic riser (para 13-27)
- Install check valve on hydraulic riser (para 13-31)

13-15. HYDRAULIC RISER INSTALLATION PROCEDURE (CONT)

FRAME 1

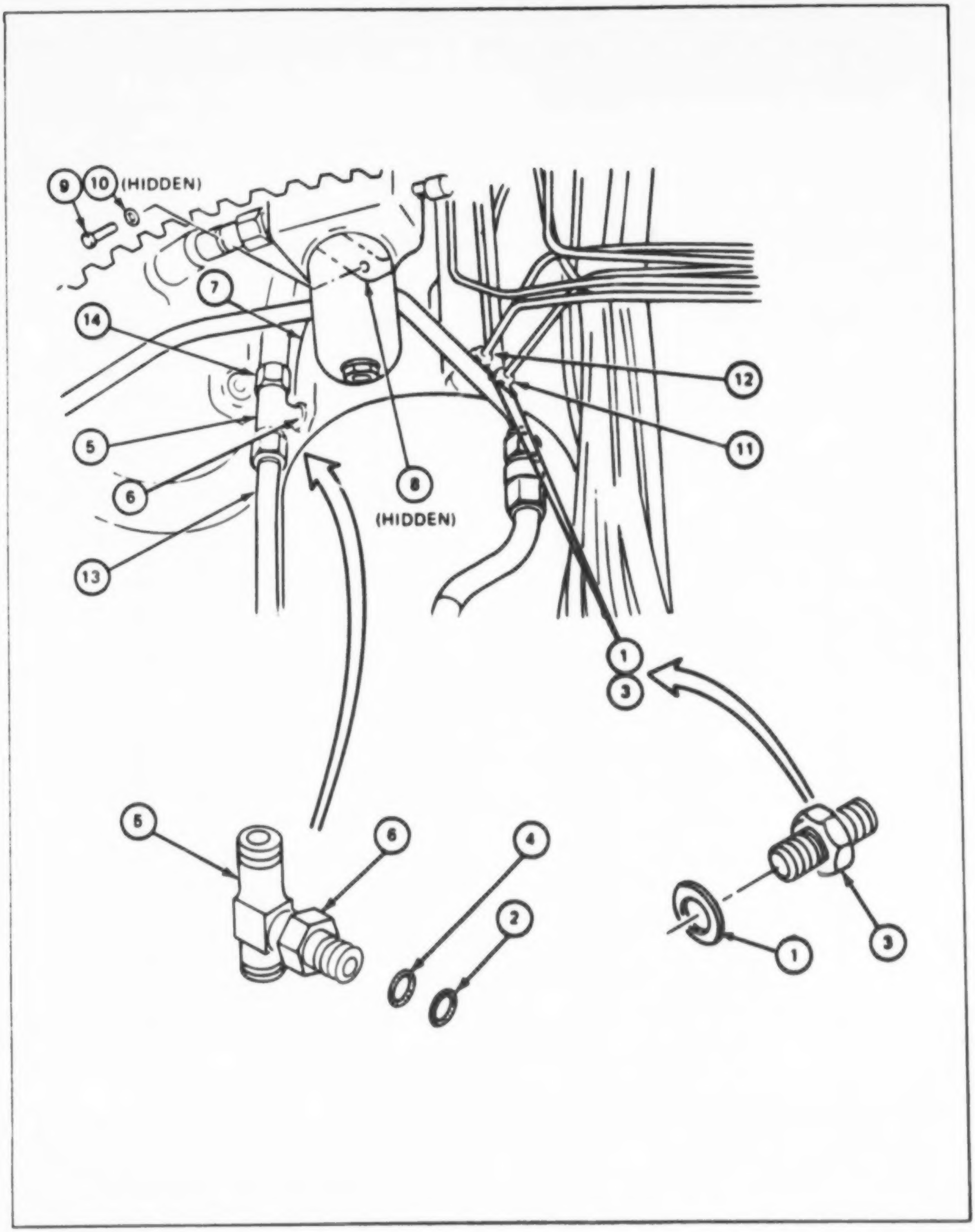
Step	Procedure
1.	Coat preformed packing (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put new preformed packing (1) on oil filter (2).
3.	Put new gasket (3) on reservoir (4). Line up screw holes in gasket with screw holes on top of reservoir.
4.	Put riser (5) on reservoir (4). Line up screw holes. Make sure packing (1) goes through port on bottom of riser (5).
5.	Push riser (5) down on reservoir (4) as far as it will go.
6.	Using Allen wrench, attach riser (5) to reservoir (4) with six screws (6) and six lockwashers (7).
7.	Using 5/16" hex head socket and torque wrench, tighten screws (6) to between 192 and 216 inch-pounds (JPG).
	GO TO FRAME 2



13-15. HYDRAULIC RISER INSTALLATION PROCEDURE (CONT)

FRAME 2

Step	Procedure
	NOTE Do steps 1 through 4 if riser (7) was replaced.
1.	Coat two preformed packings (1) and preformed packing (2) with hydraulic fluid.
2.	Using O-ring extractor tool, put two preformed packing (1) on two nipples (3) (JPG).
3.	Using O-ring extractor tool, put non-metallic washer (4) and preformed packing (2) on tee (5) and against nut (6) (JPG).
4.	Using 13/16" open end wrench, put two nipples (3) in riser (7) ports MD and ME.
5.	Using 3/4" socket wrench with extension, attach riser (7) to bracket (8) with two screws (9) and two lockwashers (10).
6.	Using 9/16" wrench, connect tube (11) to riser (7) port MD.
7.	Using 9/16" wrench, connect tube (12) to riser (7) port ME.
8.	Using 1" open end wrench, put tee (5) in riser (7) port HP and tighten nut (6).
9.	Using 1" wrench, connect tubes (13) and (14) to tee (5).
	NOTE Follow-on Maintenance Action Required: Install manual elevation accumulator (TM-20-2-3). Install shuttle valve (para 13-22). Install manual elevation pump (para 13-55). Install gunner's control (TM-20-2-3). Pressurize manual elevation accumulator (TM-20-2-3). Bleed hydraulic system (TM-20-2-3). Test hydraulic riser (para 13-13) Traverse turret in power mode to make sure it operates properly (TM-10).
	END OF TASK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LIST OF EFFECTIVE PAGES

INSERT LATEST CHANGED PAGES. DESTROY SUPERSEDED PAGES.

NOTE: The portions of the text affected by the changes are indicated in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of issue for original and changed pages are:

Original ..... 0 .....11 July 1980

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 453 CONSISTING OF THE FOLLOWING:

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B Blank	0	13-259 - 13-265	0
i - ii	0	13-266 Blank	0
13-1 - 13-13	0	13-267 - 13-281	0
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		Metric Conversion Chart	0
		Cover	0

*Zero in this column indicates an original page.

13-16. HYDRAULIC RISER DISASSEMBLY PROCEDURE

TOOLS: Internal retaining ring pliers
3/16" socket head screw key (Allen wrench)
1" combination wrench
O-ring extractor kit
Vise
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: 2" jacking screw (MS 16997-66) (two)
Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Remove retaining rings
Remove preformed packings
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove hydraulic riser (para 13-14)
Remove shuttle valve (para 13-21)
Remove manual elevation pump (para 13-54)

13-16. HYDRAULIC RISER DISASSEMBLY PROCEDURE

TOOLS: Internal retaining ring pliers
3/16" socket head screw key (Allen wrench)
1" combination wrench
O-ring extractor kit
Vise
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: 2" jacking screw (MS 16997-66) (two)
Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

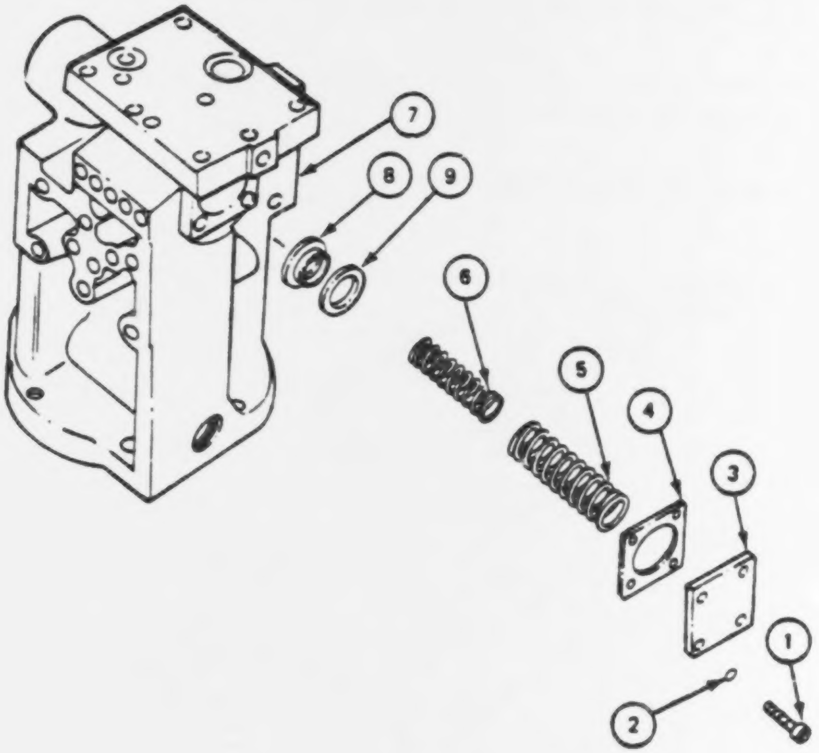
REFERENCES: JPG for procedures to:
Remove retaining rings
Remove preformed packings
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove hydraulic riser (para 13-14)
Remove shuttle valve (para 13-21)
Remove manual elevation pump (para 13-54)

13-16. HYDRAULIC RISER DISASSEMBLY PROCEDURE (CONT)

FRAME 1

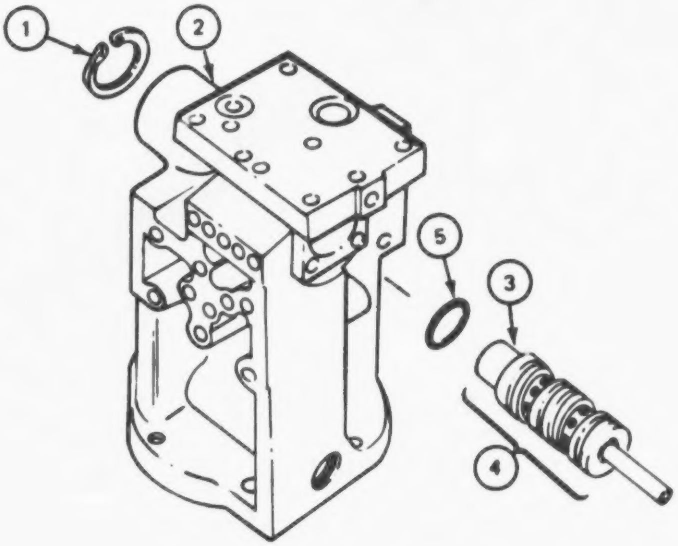
Step	Procedure
	WARNING Cover (3) is under spring pressure. Use jacking screws to remove cover and springs safely.
1.	Using Allen wrench, remove two screws (1) and two lockwashers (2) from upper left and lower right corners of cover (3).
2.	Put two short jacking screws in two empty screw holes. Turn jacking screws in as far as they will go.
3.	Using Allen wrench, remove other two cover screws (1) and two lockwashers (2). Turn screws evenly as cover (3) moves outward.
4.	Using Allen wrench, remove two long jacking screws and cover (3).
5.	Remove cover gasket (4).
6.	Remove springs (5) and (6) from riser body (7).
	NOTE Keep shims for assembly (para 13-17).
7.	Remove seat (8) and shims (9) from riser body (7). GO TO FRAME 2



13-16. HYDRAULIC RISER DISASSEMBLY PROCEDURE (CONT)

FRAME 2

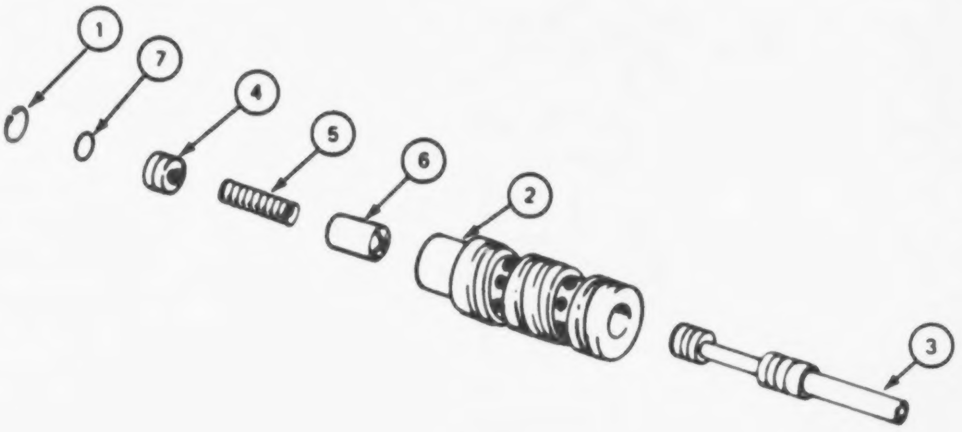
Step	Procedure
1.	Using pliers, remove large retaining ring (1) from riser body (2) (JPG).
2.	Push on end of sleeve (3) that sticks out. Remove sleeve (3) and spool assembly (4) from riser body (2).
3.	Using O-ring extractor tool, remove four preformed packings (5) from sleeve and spool assembly (4) (JPG). Throw preformed packing away.
	GO TO FRAME 3



13-16. HYDRUALIC RISER DISASSEMBLY PROCEDURE (CONT)

FRAME 3

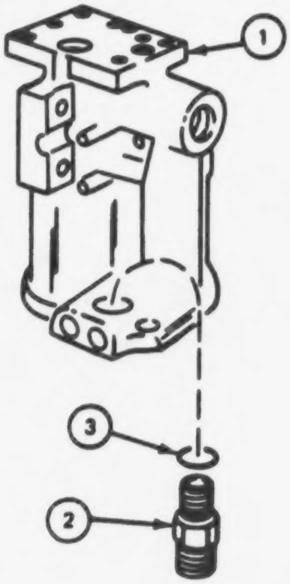
Step	Procedure
1.	Using pliers, remove small retaining ring (1) from small end of sleeve (2) (JPG).
2.	Push on small end of spool (3). Take retainer (4), small spring (5), and snubber (6) from small end of sleeve (2).
3.	Remove spool (3) from sleeve (2).
	NOTE Spool (3) and sleeve (2) are a matched set. Keep them near each other at all times.
4.	Using O-ring extractor tool, remove preformed packing (7) from retainer (4) (JPG). Throw preformed packing away. GO TO FRAME 4



13-16. HYDRAULIC RISER DISASSEMBLY PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Put riser housing (1) in vise.
2.	Using combination wrench, remove adapter (2) from riser housing (1).
3.	Using O-ring extractor tool, remove preformed packing (3) from adapter (2) (JPG). Throw preformed packing away.
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of parts (para 13-12).
	END OF TASK



13-17. HYDRAULIC RISER ASSEMBLY PROCEDURE

TOOLS:
1" combination wrench
3/16" socket head screw key (Allen wrench)
3/16" hex head socket (3/8" drive)
3/8" drive torque wrench (0-150 inch-pounds)
Internal retaining ring pliers
O-ring extractor tool

SUPPLIES:
2" jacking screw (two) (MS 16997-66)
Preformed packing (MS 28775-110)
Preformed packing (four) (MS 28775-214)
Hydraulic fluid (item 10, App. A)
Lint-free cloths (item 21, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Install preformed packings
Install retaining rings
Use torque wrench

PRELIMINARY PROCEDURES: Inspect hydraulic riser (para 13-12)

GENERAL INSTRUCTIONS:

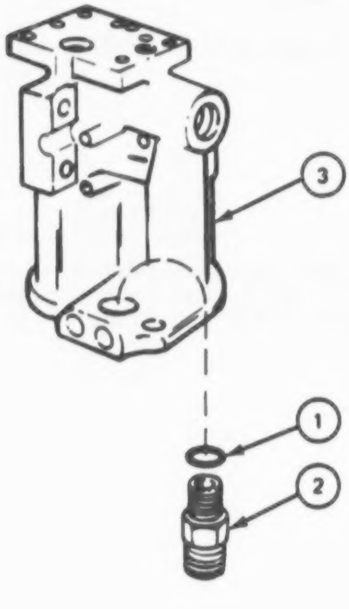
CAUTION

Hydraulic parts must be protected from dirt during assembly. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

13-17. HYDRAULIC RISER ASSEMBLY PROCEDURE (CONT)

FRAME 1

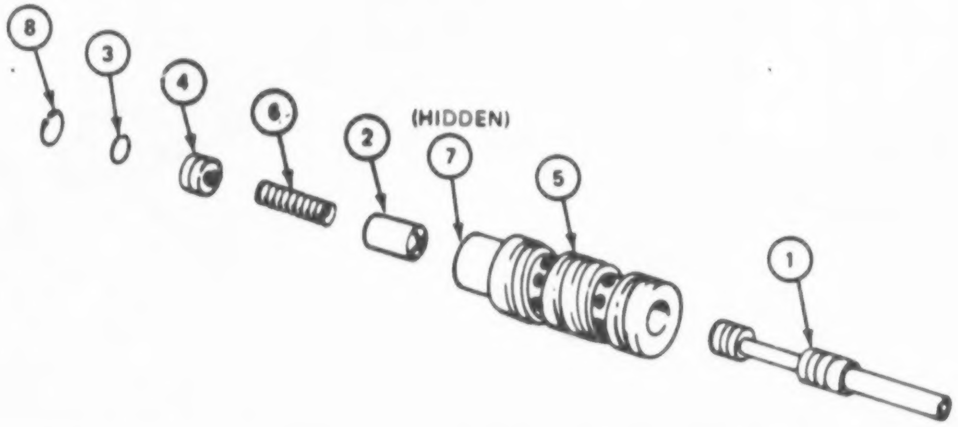
Step	Procedure
1.	Coat preformed packing (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put preformed packing (1) on adapter (2) (JPG).
3.	Using combination wrench, put adapter (2) in riser housing (3).
	GO TO FRAME 2



13-17. HYDRAULIC RISER ASSEMBLY PROCEDURE (CONT)

FRAME 2

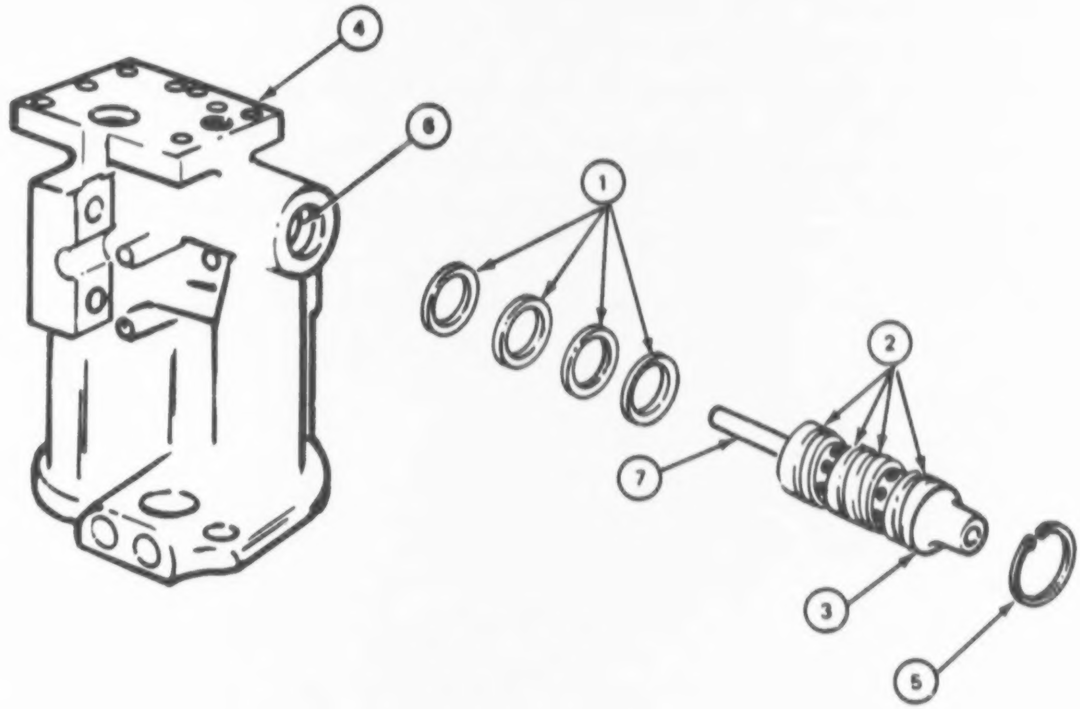
Step	Procedure
	NOTE Spool (1) and sleeve (5) must be a matched set. Make sure both parts are from the same matched set. Parts that are not matched will not work.
1.	Coat spool (1), snubber (2), and preformed packing (3) with hydraulic fluid.
2.	Using O-ring extractor tool, put preformed packing (3) on retainer (4) (JPG).
3.	Put spool (1) in sleeve (5).
	NOTE Snubber (2) goes into sleeve (5) closed end first.
4.	Put snubber (2) in sleeve (5).
5.	Put spring (6) in snubber (2).
6.	Put retainer (4) in end of spring (6). Push retainer (4) and preformed packing (3) into sleeve (5) past groove (7).
7.	Using pliers, put retaining ring (8) in groove (7) (JPG).
8.	Push on small end of spool (1). Check to be sure retainer (4) is against retaining ring (8) and spool (1) springs in and out smoothly.
	GO TO FRAME 3



13-17. HYDRAULIC RISER ASSEMBLY PROCEDURE (CONT)

FRAME 3

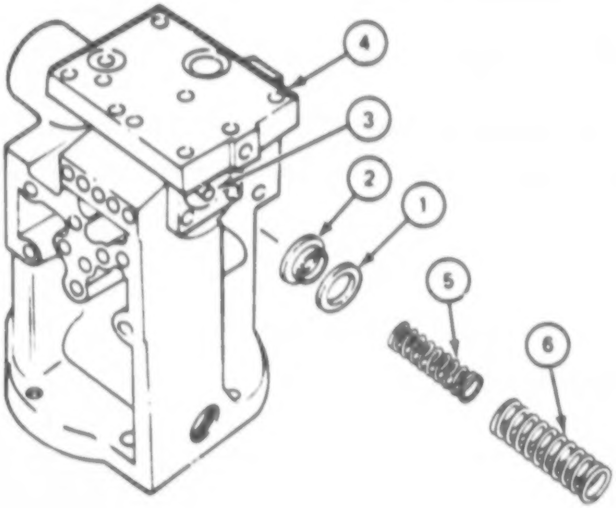
Step	Procedure
1.	Coat four new preformed packings (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put four preformed packings (1) in four grooves (2) in sleeve (3) (JPG).
3.	Put sleeve (3) in riser housing (4). Push sleeve all the way inside riser housing.
4.	Using pliers, put retaining ring (5) in groove (6) (JPG).
5.	Push on spool (7) until shoulder of sleeve (3) is against retaining ring (5). Check to be sure sleeve (3) sticks out of riser housing (4).
	GO TO FRAME 4



13-17. HYDRAULIC RISER ASSEMBLY PROCEDURE (CONT)

FRAME 4

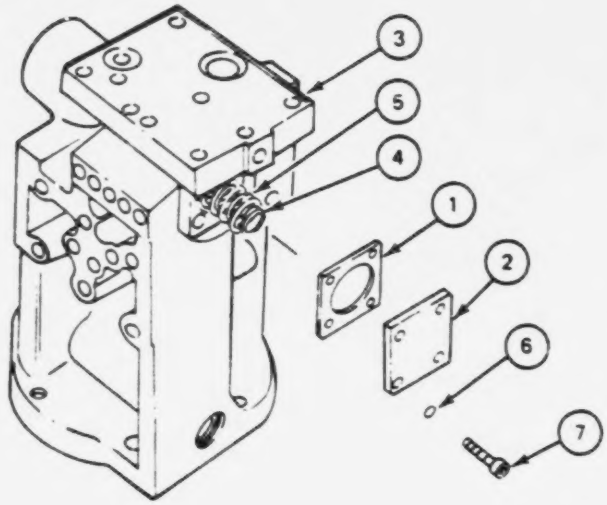
Step	Procedure
	NOTE Number of shims (1) needed for operation depends on riser test (para 13-13). For assembly before test, same number of shims removed during disassembly (para 13-16) should be used.
1.	Put shims (1) on seat (2).
2.	Put seat (2) over end of spool (3) in riser housing (4). Check to be sure shims (1) stay on seat (2).
3.	Put spring (5) and spring (6) over end of spool (3). Check to be sure spring (6) is against shims (1).
	GO TO FRAME 5



13-17. HYDRAULIC RISER ASSEMBLY PROCEDURE (CONT)

FRAME 5

Step	Procedure
	WARNING Cover (2) is installed under strong spring pressure. Jacking screws are used to squeeze springs safely. Follow procedure carefully. Spring pressure is strong enough that cover could fly off and hurt you.
1.	Put new gasket (1) on cover (2). Line up screw holes.
2.	Put one jacking screw through upper left hole in cover (2).
3.	Put one long jacking screw through lower right hole in cover (2).
4.	Line up mounting holes in cover (2) with mounting holes in riser housing (3). Start two jacking screws into riser housing (3).
5.	Using Allen wrench, turn jacking screws evenly to squeeze spring (4) and spring (5). Turn jacking screws in as far as they will go. Do not tighten.
6.	Using Allen wrench, put two lockwashers (6) and two screws (7) in lower left and upper right holes in cover (2).
7.	Using Allen wrench, remove two jacking screws from upper left and lower right holes in cover (2).
8.	Using Allen wrench, put two lockwashers (6) and two screws (7) in cover (2).
9.	Using hex head socket and torque wrench, tighten four screws (7) to between 60 and 85 inch-pounds (JPG).
	NOTE Follow-on Maintenance Action Required: Install hydraulic riser (para 13-15)
	END OF TASK



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Section 5. SHUTTLE VALVE

13-18. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks Inspection	Test	Removal	Installation	Disassembly	Assembly
Shuttle Valve	13-19	13-20	13-21	13-22	13-23	13-24

13-19. SHUTTLE VALVE INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Disassemble shuttle valve (para 13-23)

GENERAL INSTRUCTIONS:

NOTE

If part is bad, order repair part or next higher assembly as required.

13-19. SHUTTLE VALVE INSPECTION PROCEDURE (CONT)

FRAME 1

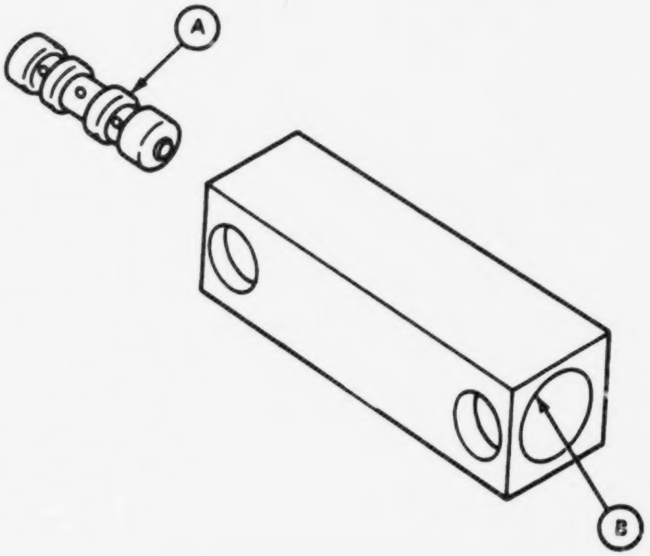
Step	Procedure
	SUPPORT SHOP WORK
1.	Take shuttle valve to shop where inspection equipment is available.
2.	Make dimensional check.

Reference	Point of Measurement	Measurement
A	OD of spool assembly	0.3120 to 0.3130
B	ID of valve body	0.3135 to 0.3140

NOTE

Tag parts that are out of tolerance.

Step	Procedure
3.	After support shop work, return shuttle valve to turret shop.
	END OF TASK



13-20. SHUTTLE VALVE TEST PROCEDURE

TEST EQUIPMENT: Suitable fittings, preformed packings and tools
Shuttle valve test manifold (fabricated tool, item 8, App. B)
M3 oil pump
Watch with sweep second hand
Measuring cup (8 ounce)
Pressure gauge (0 to 2000 psi)

TOOLS: 5/32" socket head screw key (Allen wrench)

SUPPLIES: Rags (item 21, App. A)
Container
Hydraulic fluid (item 10, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Operate M3 oil pump
Install preformed packings
Remove preformed packings

PRELIMINARY PROCEDURES: Remove shuttle valve (para 13-21)
Assemble shuttle valve (para 13-24)

GENERAL INSTRUCTIONS:

WARNING

Hydraulic fluid under pressure can hurt or kill you. This test requires up to 950 psi hydraulic pressure. Follow procedure carefully.

NOTE

Container and rags should be used to clean up spilled oil.

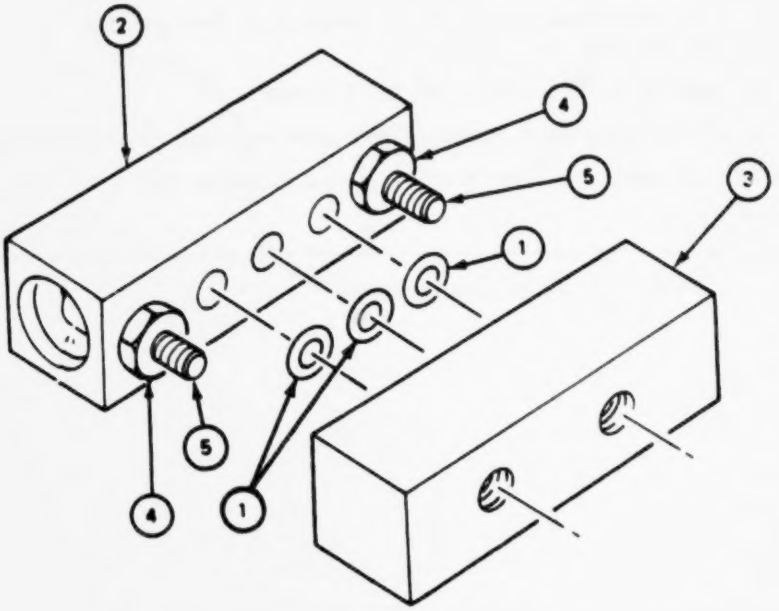
Suitable fittings, preformed packings and tools should be used to connect test equipment to parts being tested.

If normal indication is not obtained, shuttle valve is bad. Disassemble bad shuttle valve (para 13-23).

13-20. SHUTTLE VALVE TEST PROCEDURE (CONT)

FRAME 1

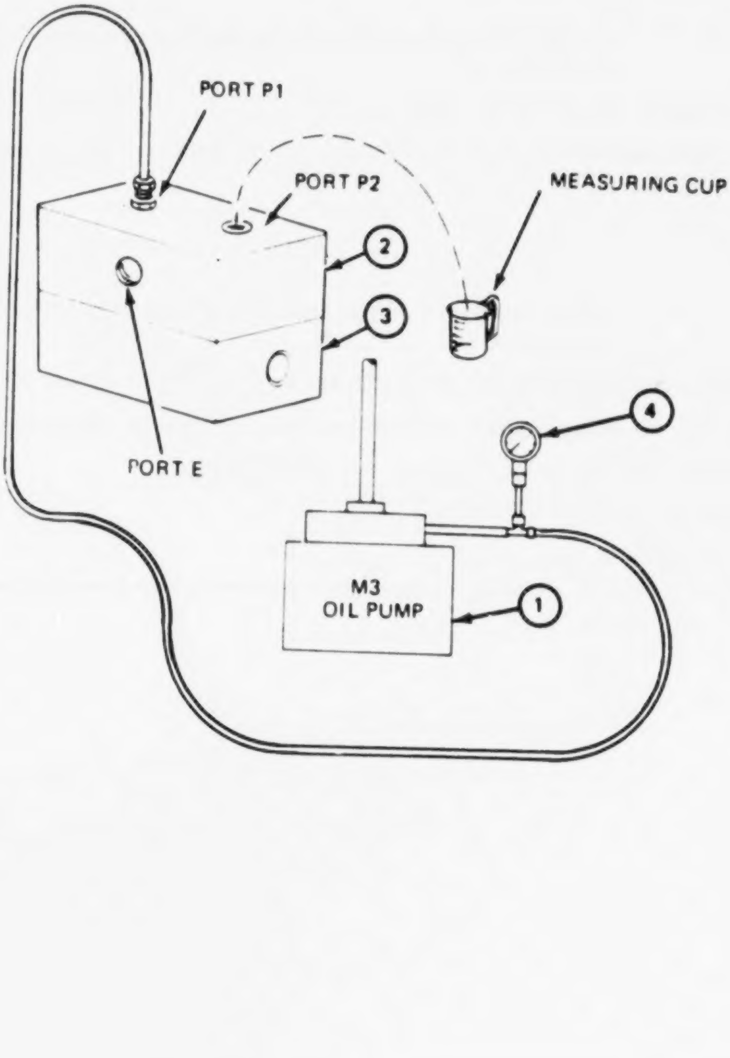
Step	Procedure
1.	Lightly coat three packings (1), and mating surfaces of shuttle valve (2) and test manifold (3) with hydraulic fluid.
2.	Put three packings (1) in test manifold (3) (JPG).
	NOTE Keep nuts (4) for installation at end of test.
3.	Using fingers, remove two nuts (4) from two screws (5).
4.	Carefully place shuttle valve (2) against test manifold (3). Put screws (5) into test manifold.
5.	Using Allen wrench, tighten screws (5) until shuttle valve (2) and test manifold (3) are held tightly together. GO TO FRAME 2



13-20. SHUTTLE VALVE TEST PROCEDURE (CONT)

FRAME 2

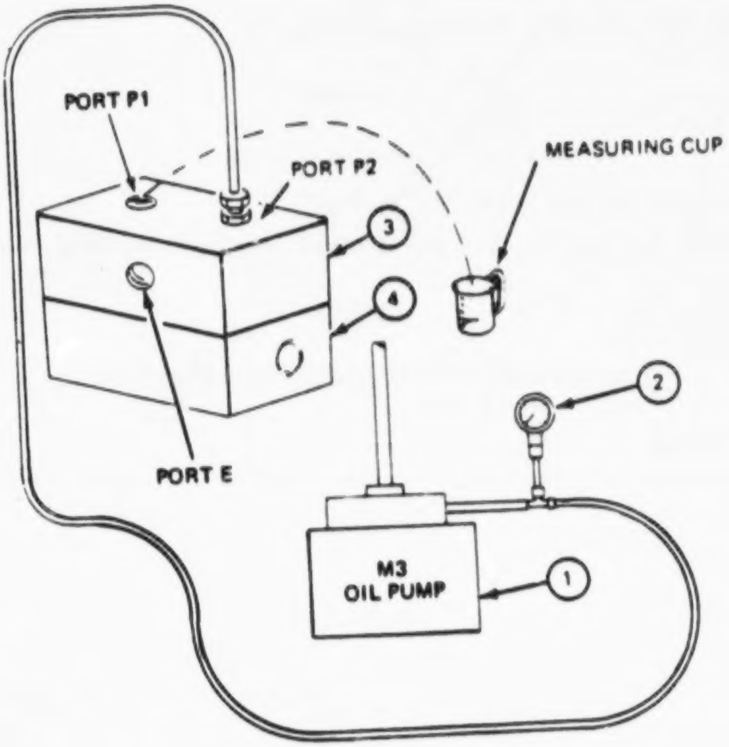
Step	Procedure
1.	Assemble M3 oil pump (1).
2.	Turn test manifold (2) with ports P1 and P2 up. Plug port E.
3.	Pour hydraulic fluid into ports P1 and P2 of test manifold (2) until shuttle valve (3) is filled.
4.	Connect M3 oil pump (1) and pressure gauge (4) to port P1 of test manifold (2).
5.	Using M3 oil pump (1), pressurize shuttle valve (3) until pressure gauge (4) reads between 900 and 950 psi (JPG).
	NOTE Except for port P2, oil should not leak out of shuttle valve (2).
6.	Check shuttle valve (3) for leaks.
7.	Turn test manifold (2) and shuttle valve (3) as needed to catch oil from port (2) in measuring cup.
	NOTE Not more than 5 drops of oil should leak from port P2 in 1 minute.
8.	Using watch, check port P2 for oil leaks for 1 minute.
9.	Using M3 oil pump (1), reduce pressure until pressure gauge (4) reads 0 psi (JPG).
10.	Disconnect M3 oil pump (1) from port P1 of test manifold (2).
	GO TO FRAME 3


PORT P1
PORT P2
MEASURING CUP
2
3
PORT E
4
M3
OIL PUMP
1

13-20. SHUTTLE VALVE TEST PROCEDURE (CONT)

FRAME 3

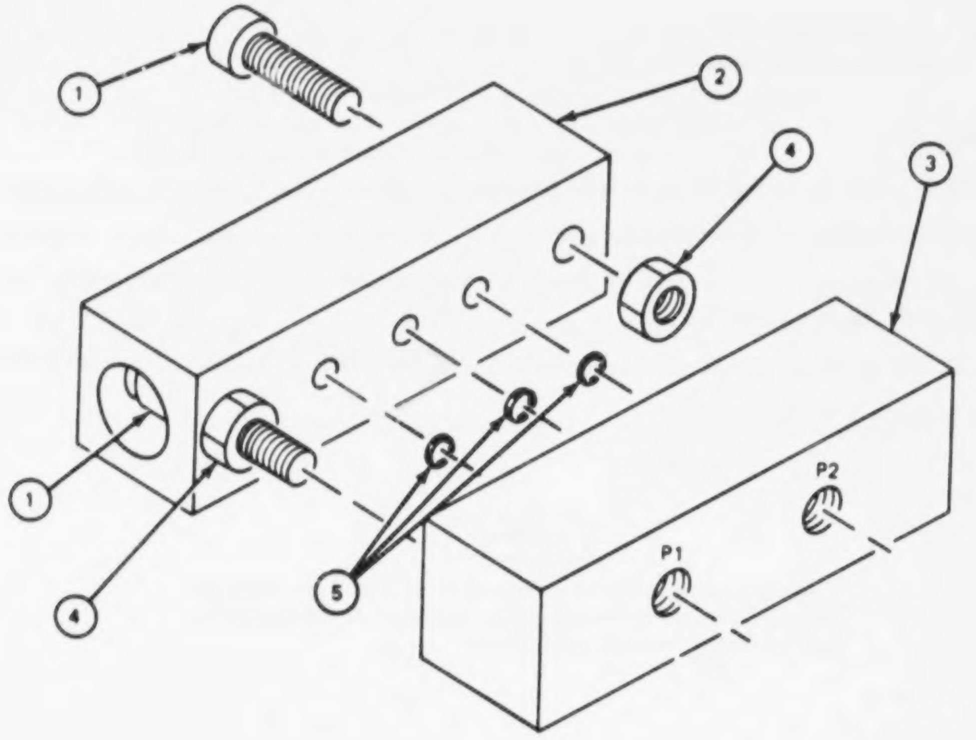
Step	Procedure
1.	Connect M3 oil pump (1) and pressure gauge (2) to port P2 of test manifold (3).
2.	Using M3 oil pump (1), pressurize shuttle valve (4) until pressure gauge (2) reads between 900 and 950 psi (JPG).
	NOTE Except for port P1, oil should not leak out of shuttle valve (4).
3.	Check shuttle valve (4) for leaks.
4.	Turn test manifold (3) and shuttle valve (4) as needed to catch oil from port P1 in measuring cup.
	NOTE Not more than 5 drops of oil should leak from port P1 in 1 minute.
5.	Using watch, check port P1 for oil leaks for 1 minute.
6.	Using M3 oil pump, reduce pressure until pressure gauge (2) reads 0 psi (JPG).
7.	Disconnect M3 oil pump (1) from test manifold (3).
8.	Unplug port E.
	GO TO FRAME 4


PORT P1
PORT P2
MEASURING CUP
3
4
2
PORT E
M3
OIL PUMP
1

13-20. SHUTTLE VALVE TEST PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Disassemble M3 oil pump.
	NOTE
	Do not remove two screws (1) from shuttle valve.
2.	Using Allen wrench, loosen two screws (1).
3.	Pull shuttle valve (2) away from test manifold (3).
	NOTE
	Use nuts (4) removed in Frame 1.
4.	Put two nuts (4) on two screws (1) hand tight.
5.	Remove three packings (5) from test manifold (3). Throw packings away (JPG).
	NOTE
	If normal indication was obtained in Frames 1 through 4, shuttle valve is good.
	END OF TASK


P2
P1

13-21. SHUTTLE VALVE REMOVAL PROCEDURE

TOOLS: 5/32" hex head socket (3/8" drive)
O-ring extractor kit
3/8" drive ratchet
11" extension (3/8" drive).

SUPPLIES: Nut (MS 35649-202) (two)
Lint-free cloths (item 21, App. A)

PERSONNEL: One

REFERENCES: JPG for procedure to remove preformed packing

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF

GENERAL INSTRUCTIONS:

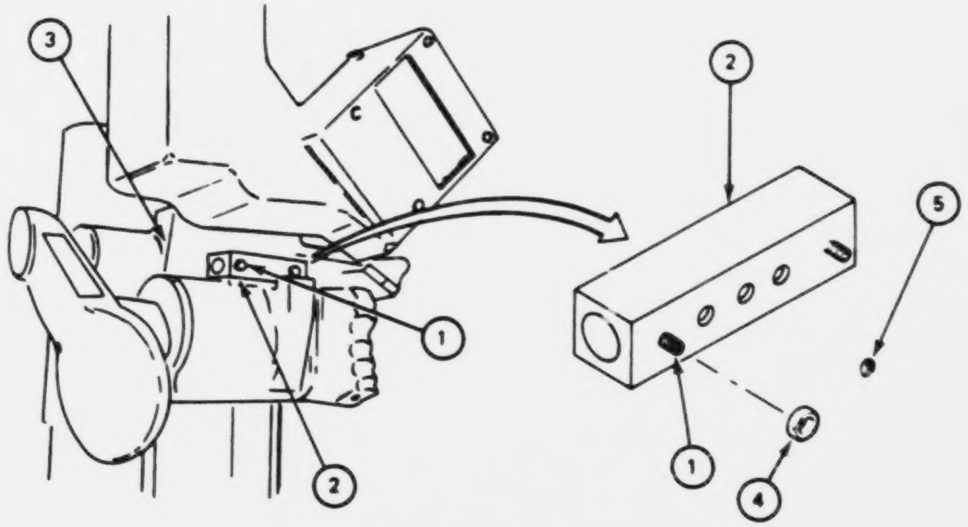
CAUTION

Hydraulic parts must be protected from dirt after removal. Dirt can damage hydraulic parts. Lint-free cloths should be used to keep hydraulic parts clean.

13-21. SHUTTLE VALVE REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
	NOTE Do not remove screws (1) from shuttle valve (2). Screws hold shuttle valve plugs in place. Loosen screws just enough to get shuttle valve (2) free of riser (3).
1.	Using socket wrench, loosen, but do not remove, two screws (1).
2.	Remove shuttle valve (2) with two screws (1) from riser (3).
3.	Put two nuts (4) on two screws (1) to hold screws in place.
4.	Using O-ring extractor tool, remove three preformed packings (5) from shuttle valve ports in riser (3) (JPG). Throw packing away.
	END OF TASK



13-22. SHUTTLE VALVE INSTALLATION PROCEDURE

TOOLS: O-ring extractor kit
5/32" hex head socket (3/8" drive)
3/8" drive ratchet
11" extension (3/8" drive)

SUPPLIES: Hydraulic fluid (item 10, App. A)
Preformed packing (three) (MS 28775-8)

PERSONNEL: One

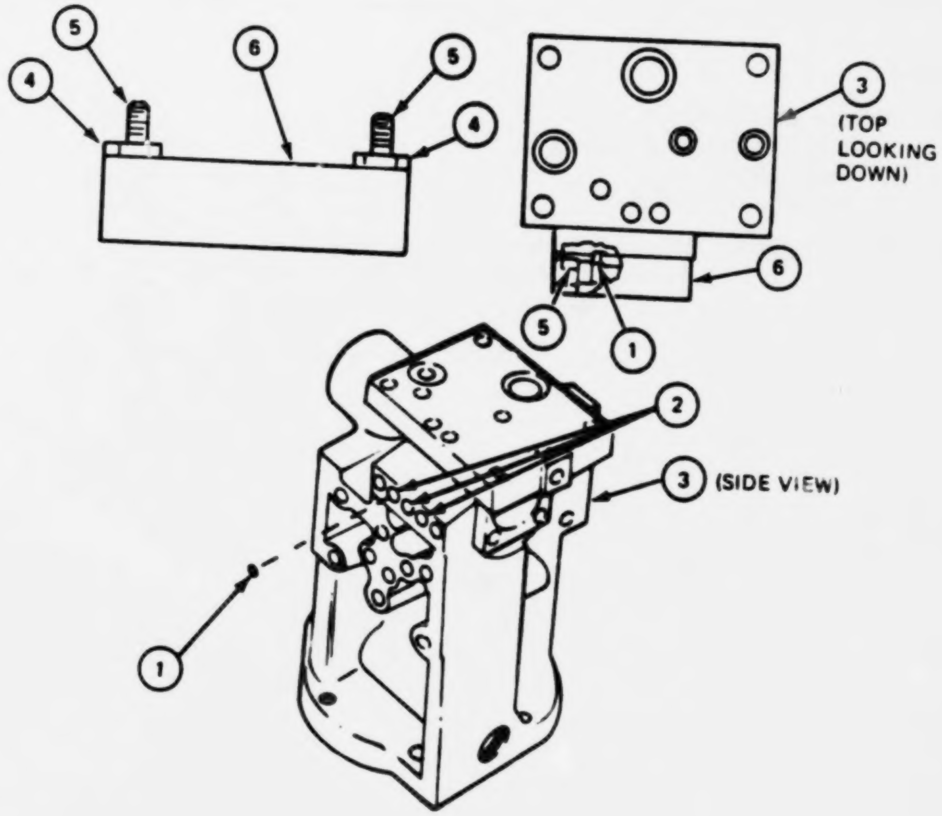
REFERENCES: JPG for procedure to install preformed packing
TM 9-2350-257-10 for procedure to traverse turret

PRELIMINARY PROCEDURES: Test shuttle valve (para 13-20)

13-22. SHUTTLE VALVE INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Coat three new preformed packings (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put preformed packings (1) in three ports (2) on hydraulic riser (3) (JPG).
3.	Remove nuts (4) from screws (5).
4.	Put shuttle valve (6) on hydraulic riser (3). Make sure that preformed packings (1) are still in three ports (2).
5.	Put screws (5) through shuttle valve (6) into hydraulic riser (3).
6.	Using Allen wrench, tighten screws (5).
	NOTE Follow-on Maintenance Action Required: Traverse turret in power mode to make sure shuttle valve operates properly (TM-10).
	END OF TASK


(TOP
LOOKING
DOWN)
(SIDE VIEW)

13-23. SHUTTLE VALVE DISASSEMBLY PROCEDURE

TOOLS: O-ring extractor kit
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Wood dowel (1/4" diameter, 6" long)
Screw (No. 4-40 NC thread, 3/4" long)
Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

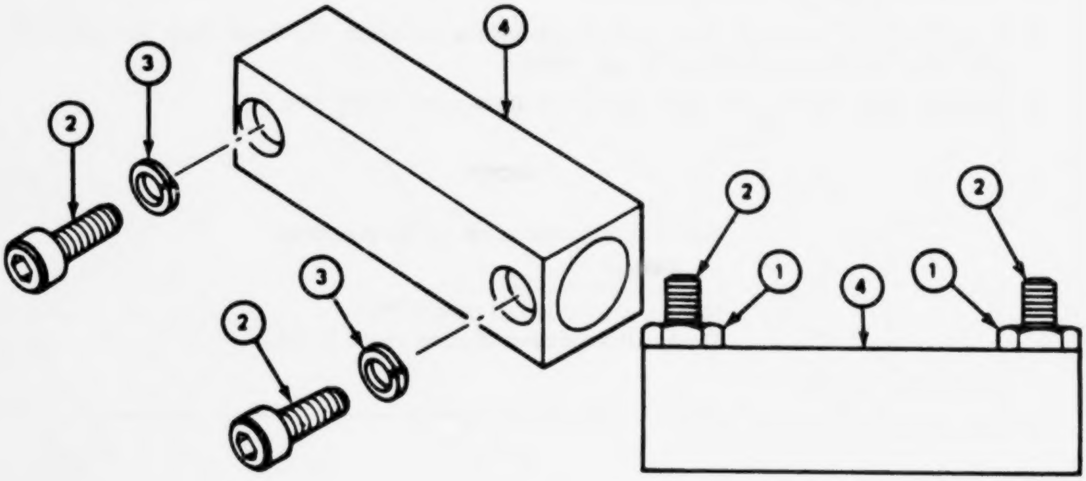
REFERENCES: JPG for procedures to:
Remove preformed packing
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove shuttle valve (para 13-21)
Test shuttle valve (para 13-20)

13-23. SHUTTLE VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 1

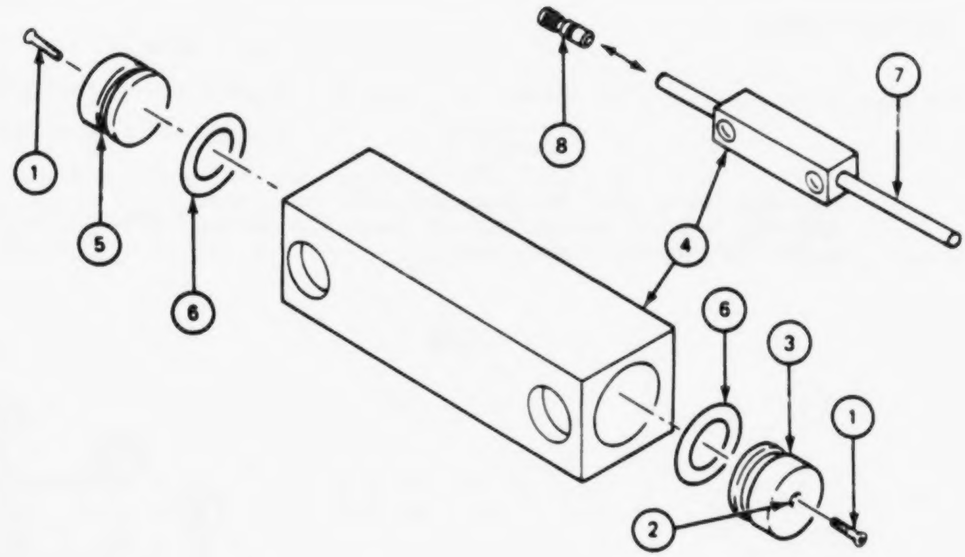
Step	Procedure
1.	Using fingers, remove two nuts (1) from screws (2).
2.	Remove two screws (2) and two lockwashers (3) from shuttle valve (4). GO TO FRAME 2



13-23. SHUTTLE VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 2

Step	Procedure
	NOTE Screw (1) must have 4-40 NC thread.
1.	Put screw (1) in threaded hole (2) of plug (3).
2.	Pull screw (1) with plug (3) from valve body (4).
3.	Remove screw (1) from plug (3).
4.	Put screw (1) in threaded hole of plug (5).
5.	Pull screw (1) with plug (5) from valve body (4).
6.	Remove screw (1) from plug (5).
7.	Using O-ring extractor tool, remove preformed packings (6) from plugs (3) and (5) (JPG). Throw preformed packings away.
8.	Using wood dowel (7), push spool (8) from valve body (4).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of parts (para 13-19).
	END OF TASK



13-24. SHUTTLE VALVE ASSEMBLY PROCEDURE

SUPPLIES: Wood dowel (1/4" diameter, 6" long)
Screw (No. 4-40 NC thread, 3/4" long)
Preformed packing (two) (MS 28775-011)
Hydraulic fluid (item 10, App. A)
Nut (two) (No. 10-24 NC thread)
Lint-free cloths (item 21, App. A)

PERSONNEL: One

REFERENCES: JPG for procedure to install preformed packing

PRELIMINARY PROCEDURES: Inspect shuttle valve (para 13-19)

GENERAL INSTRUCTIONS:

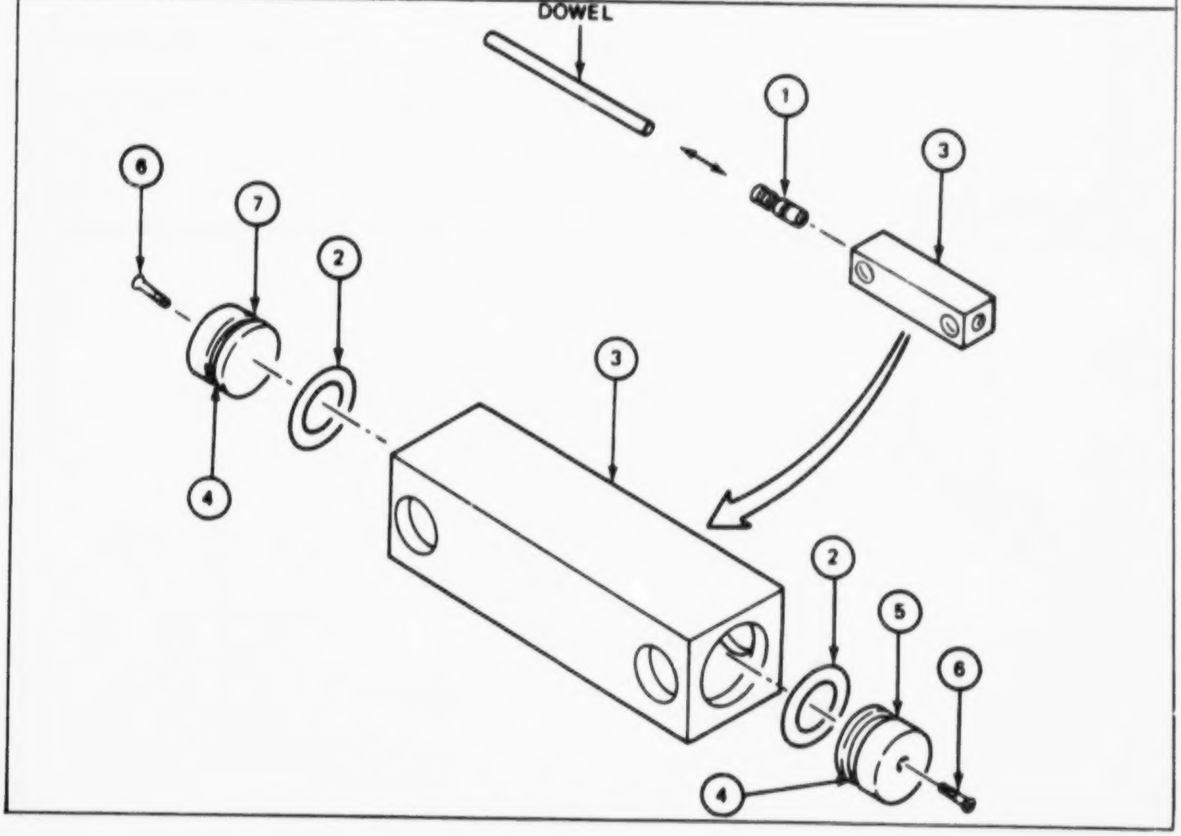
CAUTION

Hydraulic parts must be protected from dirt during assembly. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

13-24. SHUTTLE VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 1

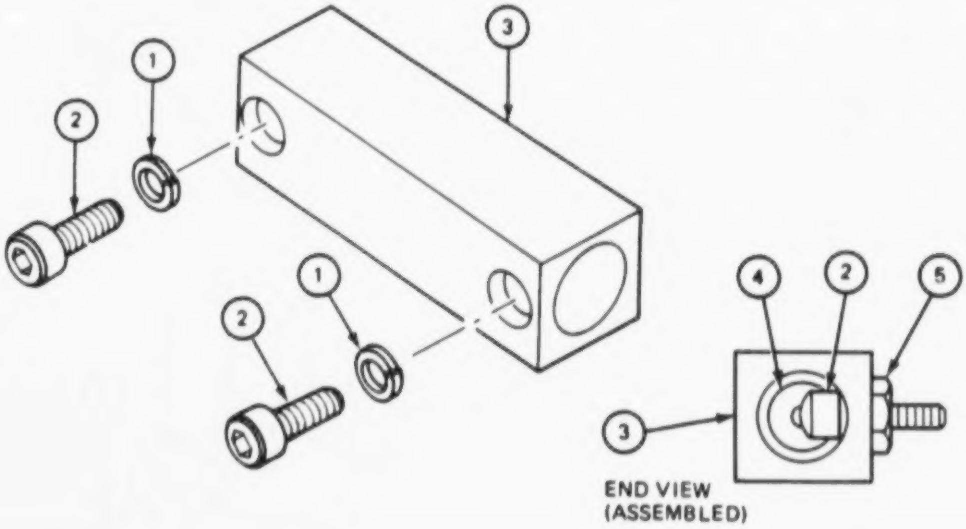
Step	Procedure
1.	Coat spool (1) and two new preformed packings (2) with hydraulic fluid.
2.	Put spool (1) in shuttle valve body (3).
3.	Using dowel, push spool (1) to middle of shuttle valve body (3). Take dowel out of shuttle valve body.
4.	Using O-ring extractor tool, put one preformed packing (2) in groove (4) of plug (5) (JPG).
5.	Put screw (6) in hole in plug (5).
6.	Using screw (6) as a handle, put plug (5) in shuttle valve body (3) as far as it will go.
7.	Take screw (6) out of plug (5).
8.	Repeat steps 4 thru 8 to put plug (7) in shuttle valve body (3).
	GO TO FRAME 2



13-24. SHUTTLE VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Put two lockwashers (1) on two screws (2).
	NOTE Two screws (2) are used to hold two plugs (4) in shuttle valve body (3). If screws do not go all the way in, push plugs (4) farther into shuttle valve body (3).
2.	Put two screws (2) and two lockwashers (1) in shuttle valve body (3).
	NOTE Two nuts (5) are used to keep two screws (2) from falling out of shuttle valve body (3).
3.	Put two nuts (5) on two screws (2). Do not tighten nuts.
	NOTE Follow-on Maintenance Action Required: Test shuttle valve (para 13-20).
	END OF TASK



Section 6. DRAIN TUBE

13-25. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks Removal	Installation
Drain Tube	13-26	13-27

13-26. DRAIN TUBE REMOVAL PROCEDURE

TOOLS: Pipe wrench, fabric-strap type
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

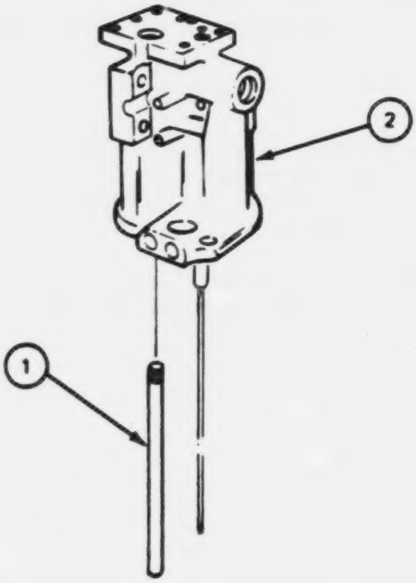
REFERENCES: JPG for procedures to:
Use strap type pipe wrench
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove manual elevation pump (para 13-54)
Remove hydraulic riser (para 13-14)

13-26. DRAIN TUBE REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using wrench, unscrew drain tube (1) from hydraulic riser (2) (JPG). **NOTE** Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). END OF TASK



13-27. DRAIN TUBE INSTALLATION PROCEDURE

TOOLS: Pipe wrench, fabric-strap type

SUPPLIES: Hydraulic fluid (item 10, App. A)

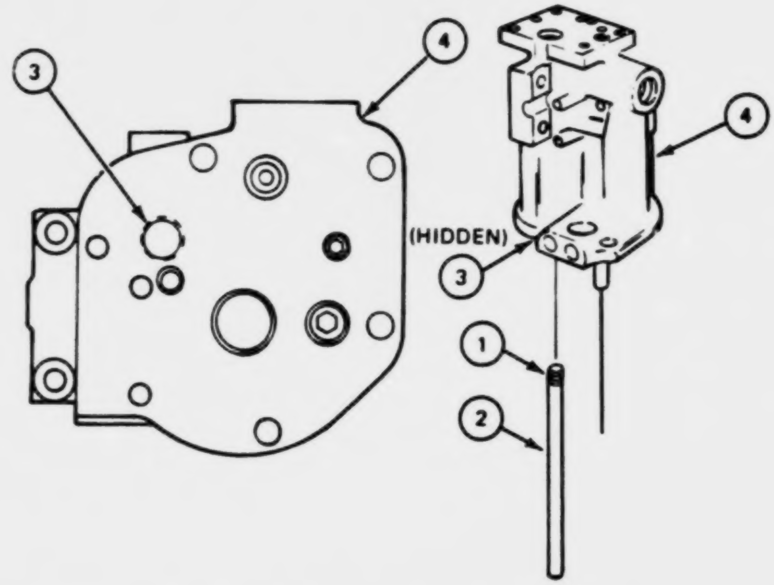
PERSONNEL: One

REFERENCES: JPG for procedure to use strap type pipe wrench

13-27. DRAIN TUBE INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Coat threaded end (1) of drain tube (2) with hydraulic fluid. **CAUTION** Make sure threaded end (1) of drain tube (2) screws easily into port (3) of hydraulic riser (4). If drain tube is hard to screw in, it may be cross-threaded.
2.	Using hands, screw drain tube (2) into port (3) of hydraulic riser (4) as far as it will go.
3.	Using wrench, tighten drain tube (2) (JPG). **NOTE** Follow-on Maintenance Action Required: Install hydraulic riser (para 13-15). END OF TASK



Section 7. CHECK VALVE

13-28. MAINTENANCE PROCEDURES INDEX

Equipment Item	Test	Removal	Tasks Installation	Disassembly	Assembly
Check Valve	13-29	13-30	13-31	13-32	13-33

13-29. CHECK VALVE TEST PROCEDURE

TEST EQUIPMENT: M3 oil pump
Pressure gauge (0-3000 psi)
Suitable fittings, preformed packings and tools

SUPPLIES: Pan

PERSONNEL: One

REFERENCES: JPG for procedures to operate M3 oil pump

PRELIMINARY PROCEDURES: Remove check valve (para 13-30)
Assemble check valve (para 13-33)

GENERAL INSTRUCTIONS:

WARNING

Oil under pressure can hurt or kill you. Follow procedures carefully. This test procedure requires up to 2050 psi.

NOTE

Suitable fittings, preformed packings, and tools should be used to connect test equipment to parts being tested.

If normal indication is not obtained, check valve is bad. Disassemble bad check valve (para 13-32).

13-29. CHECK VALVE TEST PROCEDURE (CONT)

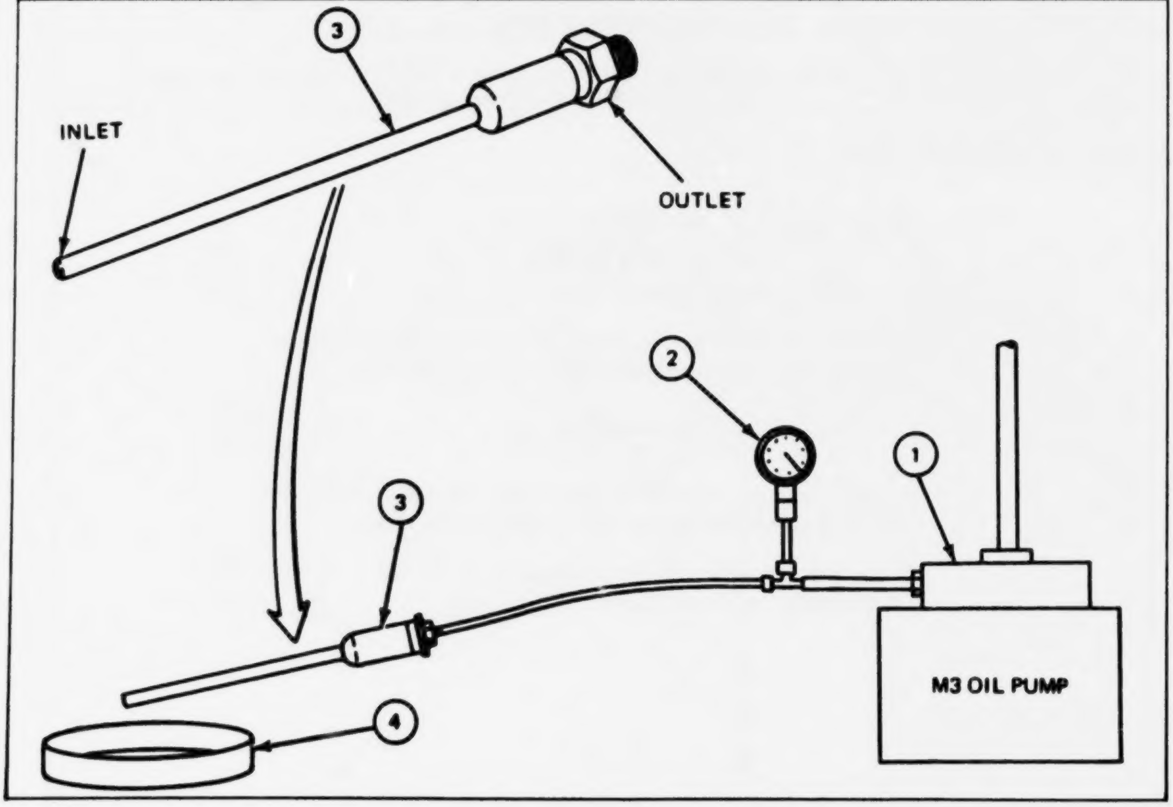
FRAME 1

Step	Procedure
1.	Connect M3 oil pump (1) and pressure gauge (2) to outlet end of check valve (3).
2.	Put inlet end of check valve (3) in pan (4).
3.	Operate M3 oil pump (1) until pressure gauge (2) reads between 2000 and 2050 psi (JPG).
4.	Check inlet end of check valve (3). Normal indication is no leaking.
5.	Operate M3 oil pump (1) to lower pressure to 0 psi (JPG).
6.	Disconnect M3 oil pump (1) and pressure gauge (2) from check valve (3).

NOTE

If normal indication is obtained, check valve is good.

END OF TASK



13-30. CHECK VALVE REMOVAL PROCEDURE

TOOLS: 13/16" combination wrench
O-ring extractor kit

PERSONNEL: One

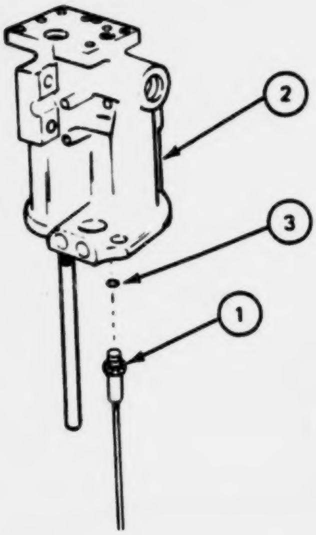
REFERENCES: JPG for procedure to remove preformed packings

PRELIMINARY PROCEDURES: Remove manual elevation pump (para 13-54)
Remove hydraulic riser (para 13-14)

13-30. CHECK VALVE REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using wrench, remove check valve (1) from hydraulic riser (2).
2.	Using O-ring extractor tool, remove preformed packing (3) from check valve (1) (JPG). Throw away preformed packing.
	NOTE
	Follow-on Maintenance Action Required:
	Test check valve (para 13-29).
	END OF TASK



13-31. CHECK VALVE INSTALLATION PROCEDURE

TOOLS: 13/16" combination wrench
O-ring extractor kit

SUPPLIES: Preformed packing
Hydraulic fluid (item 10, App. A)

PERSONNEL: One

REFERENCES: JPG for procedure to install preformed packing

PRELIMINARY PROCEDURES: Test check valve (para 13-29)
Install drain tube (para 13-27)

13-31. CHECK VALVE INSTALLATION PROCEDURE (CONT)

FRAME 1

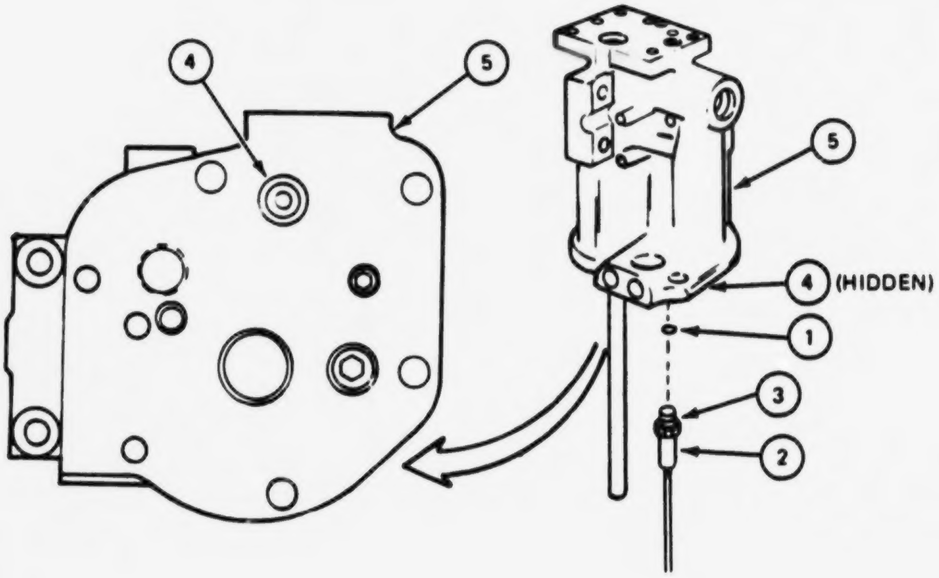
Step	Procedure
1.	Coat packing (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put preformed packing (1) on check valve (2) (JPG). Make sure preformed packing is in groove (3).
3.	Put check valve (2) in port (4) of hydraulic riser (5).
4.	Using wrench, tighten check valve (2) to hydraulic riser (5).

NOTE

Follow-on Maintenance Action Required:

Install hydraulic riser (para 13-15).

END OF TASK



13-32. CHECK VALVE DISASSEMBLY PROCEDURE

TOOLS: Vise with brass caps
13/16" combination wrench
O-ring extractor kit
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Remove preformed packings
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove manual elevation pump (para 13-54)
Remove hydraulic riser (para 13-14)
Remove check valve (para 13-30)
Test check valve (para 13-29)

13-32. CHECK VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 1

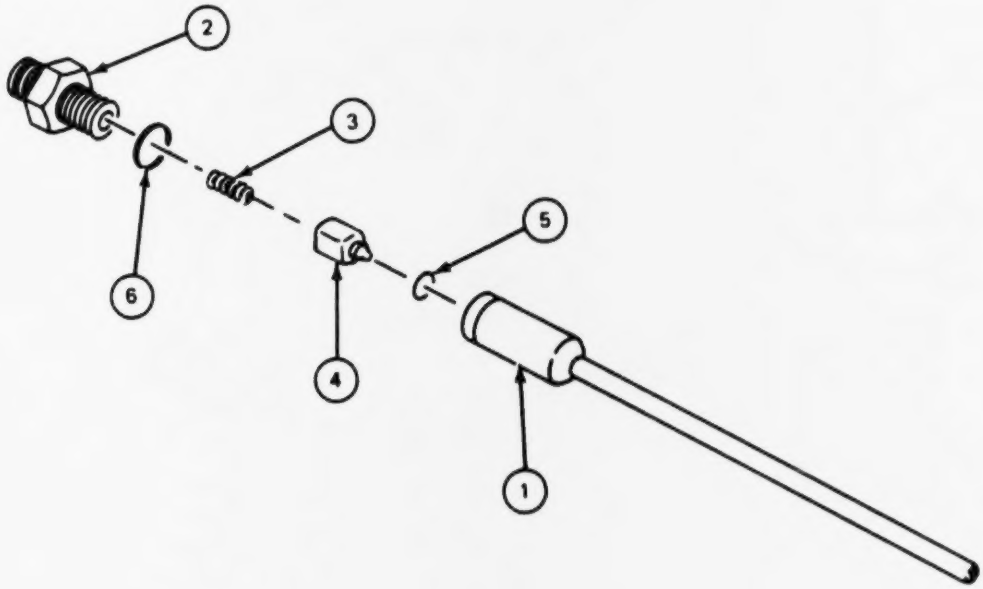
Step	Procedure
1.	Put valve body (1) in vise.
2.	Using wrench, remove adapter (2) from valve body (1).
3.	Remove spring (3) and plunger (4) from valve body (1).
4.	Using O-ring extractor tool, remove preformed packing (5) from plunger (4) (JPG). Throw away preformed packing.
5.	Using O-ring extractor tool, remove preformed packing (6) from adapter (2) (JPG). Throw away preformed packing.
6.	Remove valve body (1) from vise.

NOTE

Follow-on Maintenance Action Required:

Clean all parts (JPG).
Inspect and repair all parts (JPG).

END OF TASK



13-33. CHECK VALVE ASSEMBLY PROCEDURE

TOOLS: Strap style pipe wrench
13/16" combination wrench
O-ring extractor kit

SUPPLIES: Preformed packing (596921)
Preformed packing (596926)
Hydraulic fluid (item 10, App. A)
Lint-free cloths (item 21, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Install preformed packing
Use strap-type pipe wrench

GENERAL INSTRUCTIONS:

CAUTION

Hydraulic parts must be protected from dirt during assembly. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

13-33. CHECK VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 1

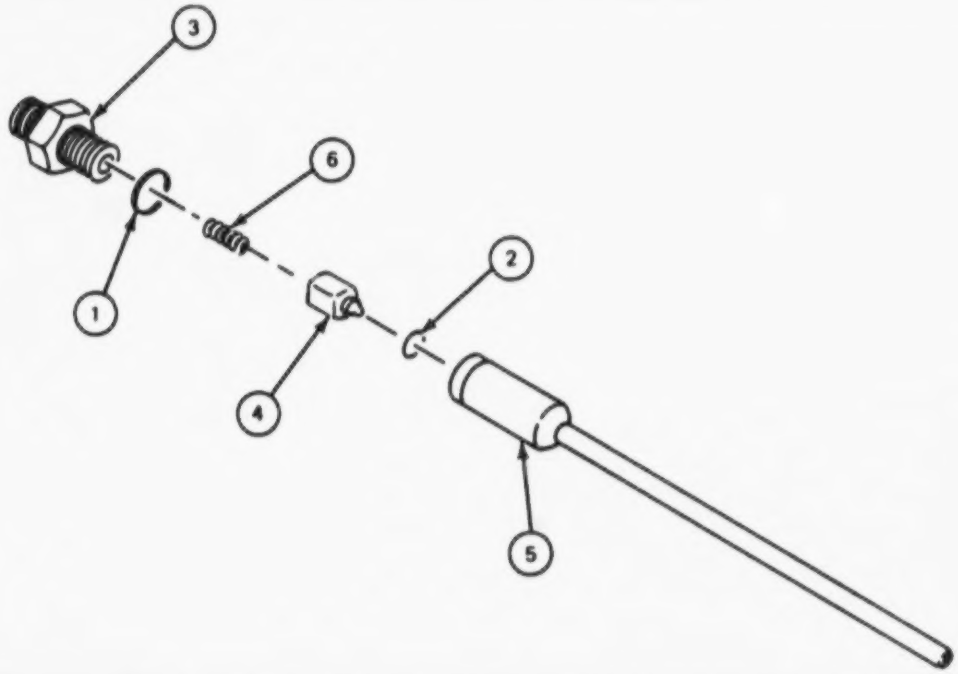
Step	Procedure
1.	Coat two packings (1) and (2) with hydraulic fluid.
2.	Using O-ring extractor tool, put preformed packing (1) on adapter (3) (JPG).
3.	Using O-ring extractor tool, put preformed packing (2) on plunger (4) (JPG).
4.	Put plunger (4), with preformed packing (2) end first, in valve body (5).
5.	Put spring (6) into valve body (5).
6.	Screw adapter (3) into valve body (5).
7.	Using pipe wrench to hold valve body (5), and combination wrench to turn adapter (3), tighten adapter (3) to valve body (5) (JPG).

NOTE

Follow-on Maintenance Action Required:

Test check valve (para 13-29).

END OF TASK



Section 8. OIL FILTER

13-34. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks					
	Service	Test	Removal	Installation	Disassembly	Assembly
Oil Filter	13-35	13-36	13-37	13-38	13-39	13-40

13-35. OIL FILTER SERVICE PROCEDURE

TOOLS: Retaining ring pliers

SUPPLIES: Reservoir element assembly
Lint-free cloths (item 21, App. A)

PERSONNEL: One

REFERENCES: JPG for procedure to remove and install retaining rings

PRELIMINARY PROCEDURES: Remove hydraulic riser (para 13-14)
Remove oil filter (para 13-37)

GENERAL INSTRUCTIONS:

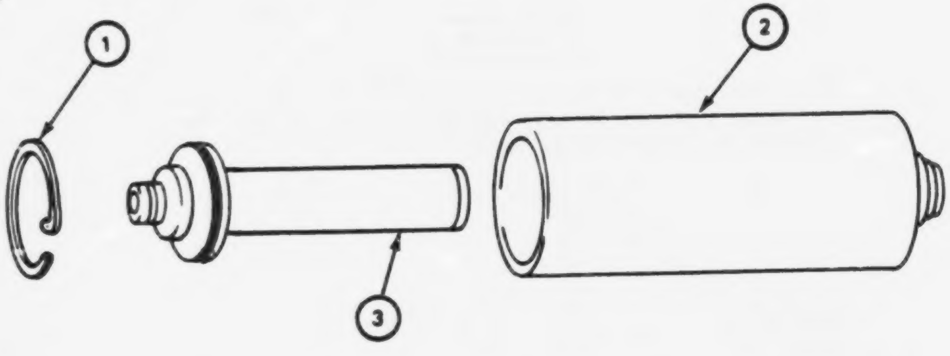
CAUTION

Hydraulic parts must be protected from dirt during servicing. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

13-35. OIL FILTER SERVICE PROCEDURE (CONT)

FRAME 1

Step	Procedure
	NOTE Power pack oil filter is serviced by replacing filter element. Outlet end of oil filter is shorter end.
1.	Using pliers, remove retaining ring (1) from oil filter (2) (JPG).
2.	Pull filter element (3) from filter (2).
3.	Deleted.
4.	Deleted.
5.	Put new filter element (3) into filter (2).
6.	Using pliers, put retaining ring (1) in groove of filter.
	NOTE Follow-on Maintenance Action Required: Install oil filter (para 13-44).
	END OF TASK



13-36. OIL FILTER TEST PROCEDURE

TEST EQUIPMENT:
- M3 oil pump
- Pressure gauge (0-2000 psi)
- Graduated cylinder
- Watch with sweep second hand
- Oil filter test fixture (fabricated tool, item 12, App B)
- Suitable fittings, packings, and tools

TOOLS: 9/16" open end wrench (two)

SUPPLIES:
- Preformed packing (MS 28775-115)
- Preformed packing (MS 28775-210)
- Hydraulic fluid (item 10, App. A)
- Pan
- Masking tape (item 36, App. A)
- Marking pen

PERSONNEL: One

REFERENCES: JPG for procedures to:
- Operate M3 oil pump
- Mark parts
- Install preformed packing
- Remove preformed packing

PRELIMINARY PROCEDURES:
- Remove oil filter (para 13-37)
- Assemble oil filter (para 13-40)

GENERAL INSTRUCTIONS:

WARNING

Hyraulic fluid under pressure can hurt or kill you. Follow procedure carefully. This test requires pressures up to 1300 psi.

NOTE

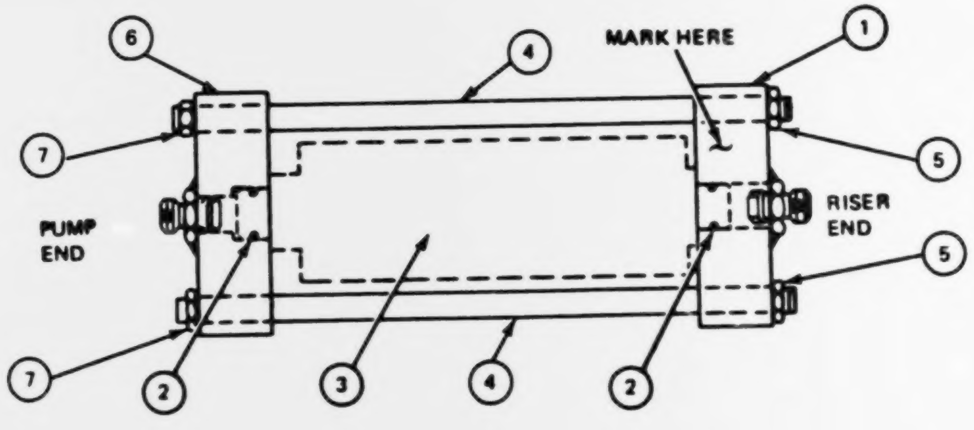
Suitable fittings, packings, and tools should be used to connect test equipment to parts being tested.

If normal indication is not obtained, oil filter is bad. Disassemble bad oil filter (para 13-39).

13-36. OIL FILTER TEST PROCEDURE (CONT)

FRAME 1

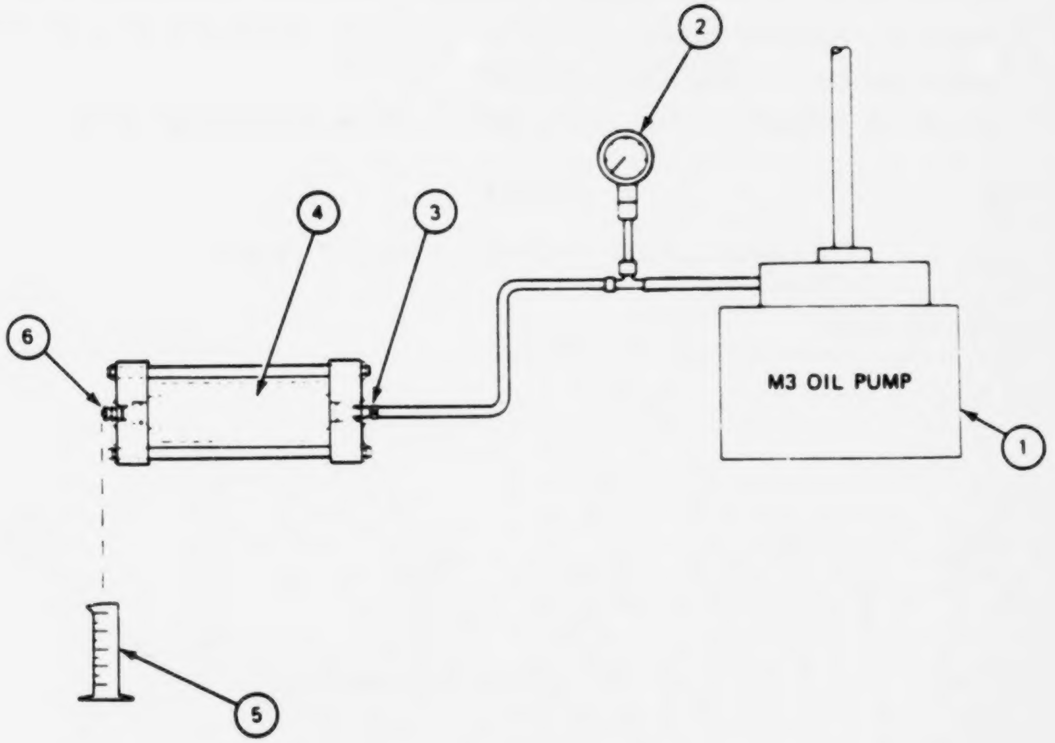
Step	Procedure
	NOTE Riser end adapter of oil filter test fixture has smaller center hole than pump end adapter.
1.	Using masking tape and marking pen, mark riser end adapter (1) (JPG).
2.	Coat two packings (2) and both ends of filter (3) with hydraulic fluid.
3.	Install two packings (2) on two ends of filter (3) (JPG).
4.	Put riser end of filter (3) in riser end adapter (1).
5.	Put two rods (4) through holes in riser end adapter (1).
6.	Put two nuts (5) on two rods (4) and tighten nuts four turns.
7.	Slide pump end adapter (6) over two rods (4) and onto pump end of filter (3).
8.	Put two nuts (7) on two rods (4).
9.	Using one wrench to hold nuts (5) and one wrench to turn nuts (7), tighten nuts (7) evenly until filter (3) is attached to fixture.
	GO TO FRAME 2



13-36. OIL FILTER TEST PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Connect M3 oil pump (1) and pressure gauge (2) to riser end port (3).
2.	Slowly operate M3 oil pump (1) until pressure gauge (2) reads between 1200 and 1300 psi (JPG). **NOTE** Normal indication is no oil leaking from oil filter except from pump end port.
3.	Using watch, check oil filter (4) for leaks for two minutes.
4.	Put graduated cylinder (5) under pump end port (6). **NOTE** Normal indication is not more than 0.05 cc leakage in one minute.
5.	Using watch, check pump end port (6) for leakage for one minute.
6.	Using graduated cylinder (5), check how much fluid leaks from pump end port (6).
7.	Operate M3 oil pump (1) to lower pressure to 0 psi (JPG). GO TO FRAME 3


M3 OIL PUMP

13-36. OIL FILTER TEST PROCEDURE (CONT)

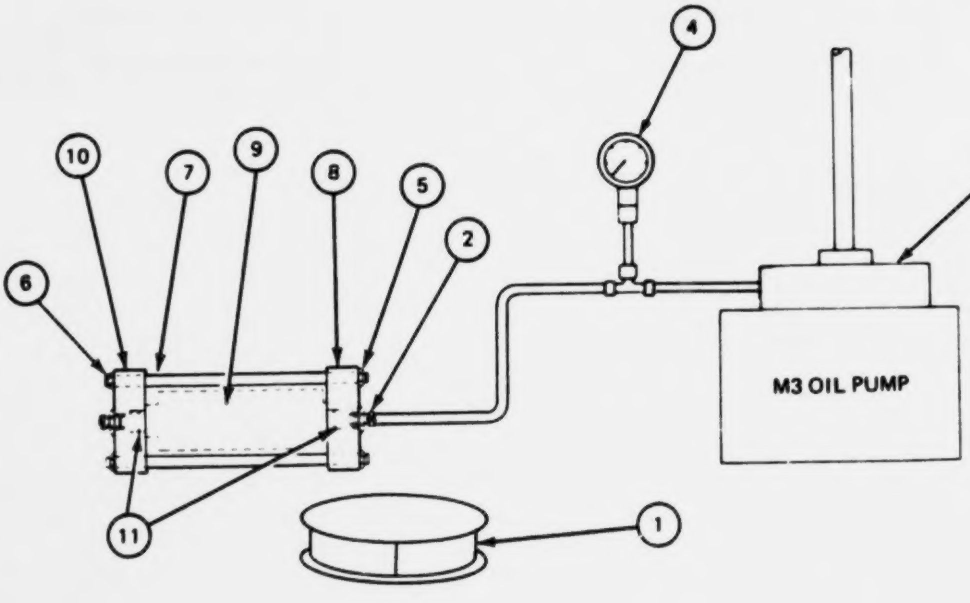
FRAME 3

Step	Procedure
1.	Put pan (1) under riser end port (2).
2.	Disconnect M3 oil pump (3) and pressure gauge (4) from riser end port (2).
3.	Using one wrench to hold nuts (5) and one wrench to turn nuts (6), remove nuts from two rods (7).
4.	Pull riser end adapter (8) away from filter (9) and two rods (7).
5.	Pull filter (9) out of pump end adapter (10).
6.	Remove two nuts (6) from two rods (7).
7.	Remove two rods (7) from pump end adapter (10).
8.	Remove two packings (11) from ends of filter (9). Throw away packings (JPG).

NOTE

If normal indication was obtained in Frame 2, oil filter is good.

END OF TASK



13-37. OIL FILTER REMOVAL PROCEDURE

TOOLS: O-ring extractor kit

SUPPLIES: Lint-free cloths (item 21, App. A)
Protective caps
Pan

PERSONNEL: One

REFERENCES: JPG for procedure to remove preformed packings
TM 9-2350-257-20-2-3 for procedure to drain hydraulic reservoir

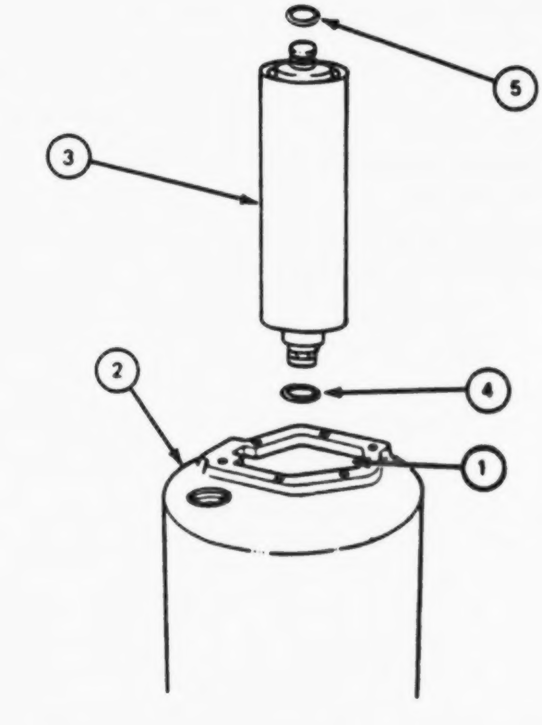
EQUIPMENT CONDITION: Hydraulic reservoir drained (TM-20-2-3)

PRELIMINARY PROCEDURES: Remove manual elevation pump (para 13-54)
Remove hydraulic riser (para 13-14)

13-37. OIL FILTER REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Reach into top opening (1) of reservoir (2). Pull filter (3) out of reservoir (2).
2.	Using O-ring extractor tool, remove preformed packing (4) from bottom end of filter (3) (JPG). Throw away packing.
	NOTE Keep shims for installation (para 13-38).
3.	Remove shims (5) from filter (3).
4.	Using pan, drain hydraulic fluid from filter (3).
5.	Using cloth, wipe hydraulic fluid from filter (3).
6.	Using caps, plug inlet and outlet ends of filter (3).
	NOTE Follow-on Maintenance Action Required: Test oil filter (para 13-36).
	END OF TASK



13-38. OIL FILTER INSTALLATION PROCEDURE

TEST EQUIPMENT: M3 oil pump
Power pack filter assembly adjustment fixture (fabricated tool, item 3, App. B)
Pressure gauge adapter
Pressure gauge (0-500 psi)
Depth gauge
Suitable hydraulic fittings and tools

SUPPLIES: Pencil and paper
Preformed packing (MS 28775-115)
Preformed packing (MS 28775-210)
Shim (7974359)
Hydraulic fluid (item 10, App. A)
Lint-free cloths (item 21, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Operate M3 hydraulic oil pump
Install preformed packing

PRELIMINARY PROCEDURES: Service oil filter (para 13-35)
Assemble oil filter (para 13-41)

GENERAL INSTRUCTIONS:

WARNING

This procedure is done with pressure up to 100 psi. Hydraulic fluid under pressure can hurt or kill you.

CAUTION

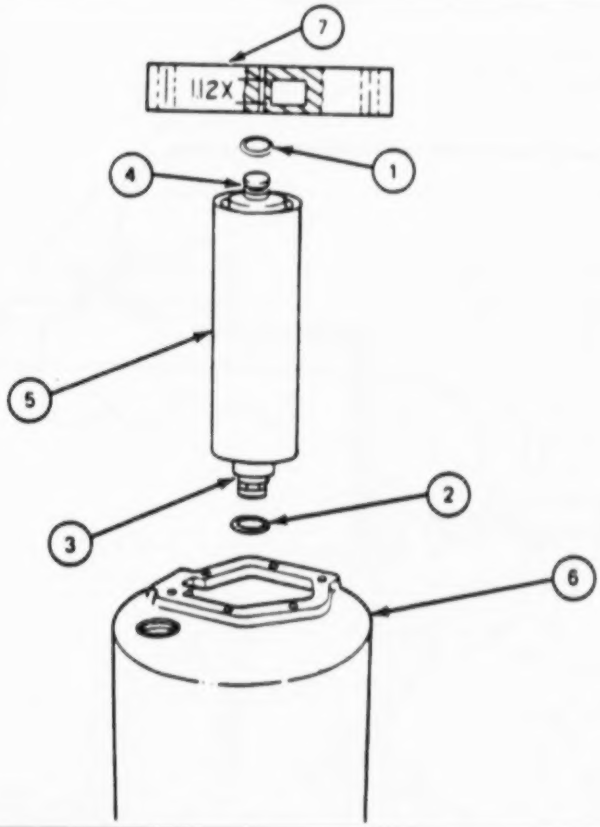
Hydraulic parts must be protected from dirt during installation. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

Suitable hydraulic fittings and tools should be used as required to connect adjustment fixture.

13-38. OIL FILTER INSTALLATION PROCEDURE (CONT)

FRAME 1

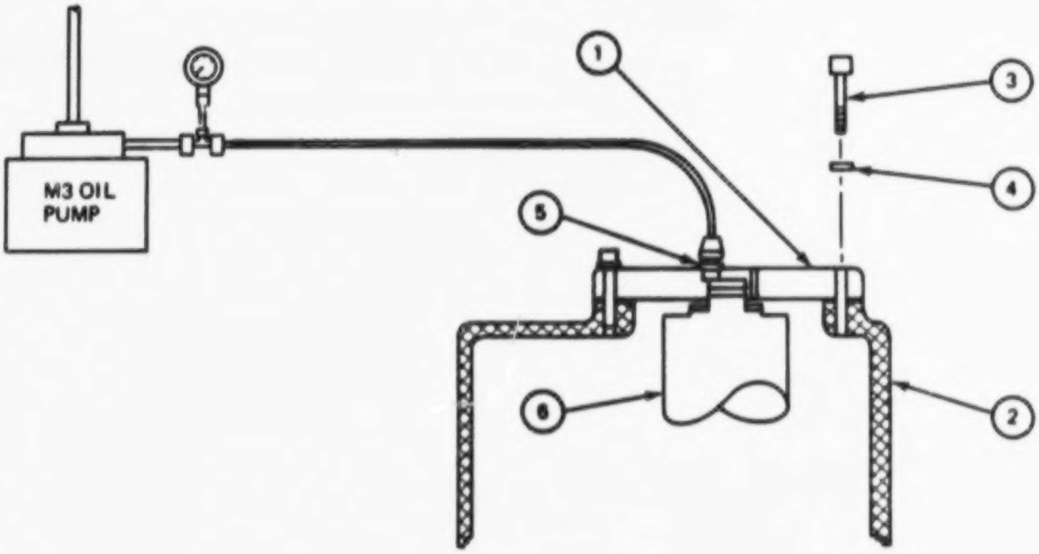
Step	Procedure
1.	Coat packings (1) and (2) with hydraulic fluid.
2.	Put packings (1) and (2) on pump (inlet) end (3) and riser (outlet) end (4) of oil filter (5) (JPG).
	NOTE Inlet end (3) of oil filter (5) is longer end.
3.	Put oil filter (5), inlet end (3) first, into oil reservoir (6) through reservoir top opening.
4.	Put adjustment fixture (7) on outlet end (4) of filter (5).
5.	Line up two screw holes in test fixture (7) with riser mounting holes in reservoir (6). GO TO FRAME 2



13-38. OIL FILTER INSTALLATION PROCEDURE (CONT)

FRAME 2

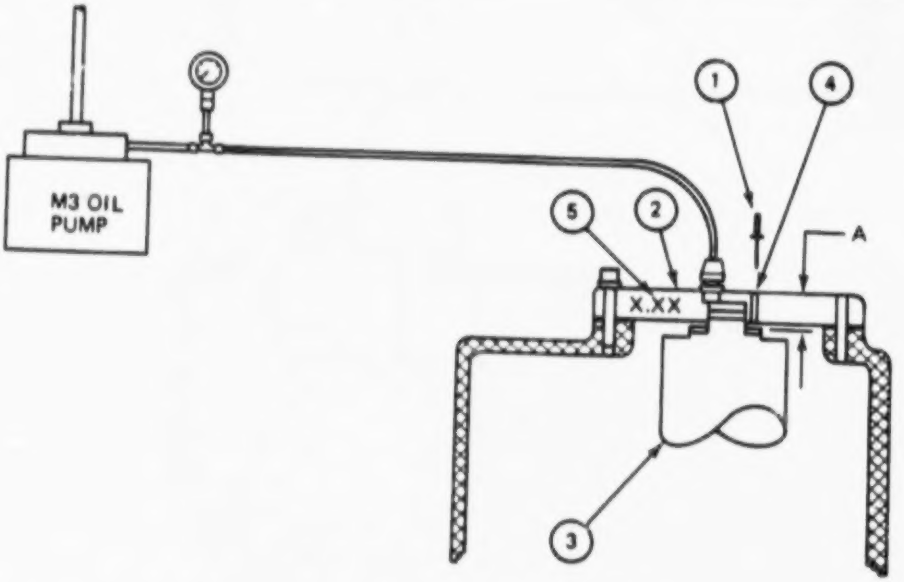
Step	Procedure
1.	Attach test fixture (1) to reservoir (2) with two screws (3) and two lockwashers (4).
2.	Assemble M3 oil pump.
3.	Put fitting (5) in text fixture (1).
4.	Connect hose from M3 oil pump to fitting (5).
5.	Using M3 oil pump, pressurize filter (6) to between 60 and 100 psi (JPG). GO TO FRAME 3



13-38. OIL FILTER INSTALLATION PROCEDURE (CONT)

FRAME 3

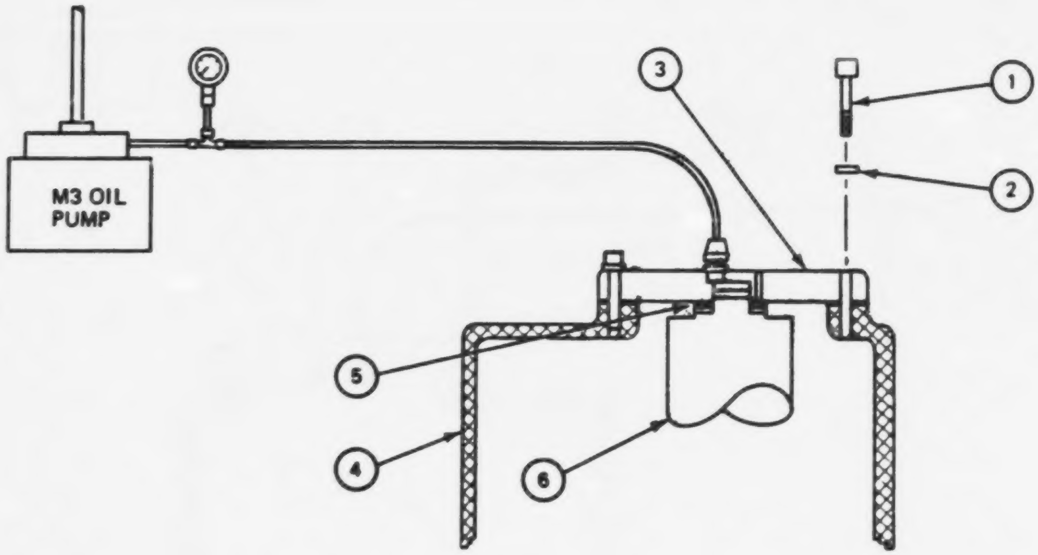
Step	Procedure
1.	Using depth gauge (1), measure distance A from top of test fixture (2) to top of filter (3) through fixture hole (4).
2.	Using pencil and paper, write down distance A.
	NOTE Actual thickness (5) of test fixture (2) is stamped on side of fixture.
3.	Using pencil and paper, subtract actual thickness (5) of test fixture (2) from distance A. Write down difference.
4.	Using M3 oil pump, reduce pressure to 0 psi (JPG).
	NOTE If difference written down in Step 3 is less than 0.010", go to Frame 4. If difference written down in Step 3 is 0.010" or more, go to Frame 5.
	GO TO FRAME 4



13-38. OIL FILTER INSTALLATION PROCEDURE (CONT)

FRAME 4

Step	Procedure
	NOTE Do the procedure in this frame only if the difference written down in Frame 3, Step 3 is less than 0.010". If the difference written down in Frame 3, Step 3 is 0.010" or more, go to Frame 5.
1.	Remove two screws (1), two lockwashers (2), and test fixture (3) from top of reservoir (4).
2.	Install shims (5) as required, on filter (6).
3.	Using Allen wrench, attach test fixture (3) to top of reservoir (4) with two screws (1) and two lockwashers (2).
4.	Using M3 oil pump, pressurize filter (6) to between 60 and 100 psi (JPG).
5.	Repeat Frame 3.
	GO TO FRAME 5



13-38. OIL FILTER INSTALLATION PROCEDURE (CONT)

FRAME 5

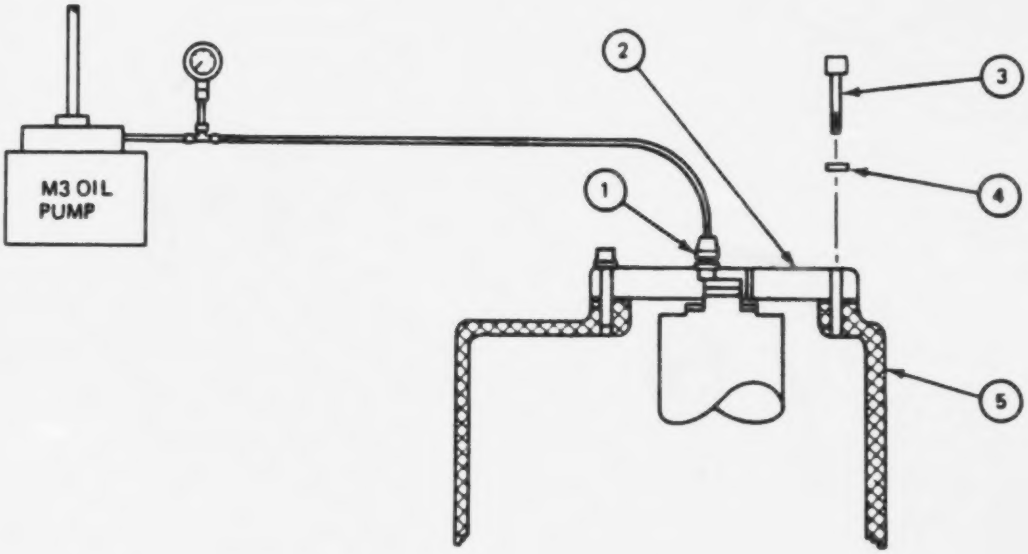
Step	Procedure
1.	Remove hose from M3 oil pump to fitting (1) on test fixture (2).
2.	Remove fitting (1) from test fixture (2).
3.	Remove two screws (3) and two lockwashers (4) that attach test fixture (2) to reservoir (5).
4.	Remove test fixture (2) from reservoir (5).
5.	Disassemble M3 oil pump.

NOTE

Follow-On Maintenance Action Required:

Install hydraulic riser (para 13-15).

END OF TASK



13-39. OIL FILTER DISASSEMBLY PROCEDURE

TOOLS: Internal retaining ring pliers
Combination slip joint pliers with cutter
O-ring extractor kit
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

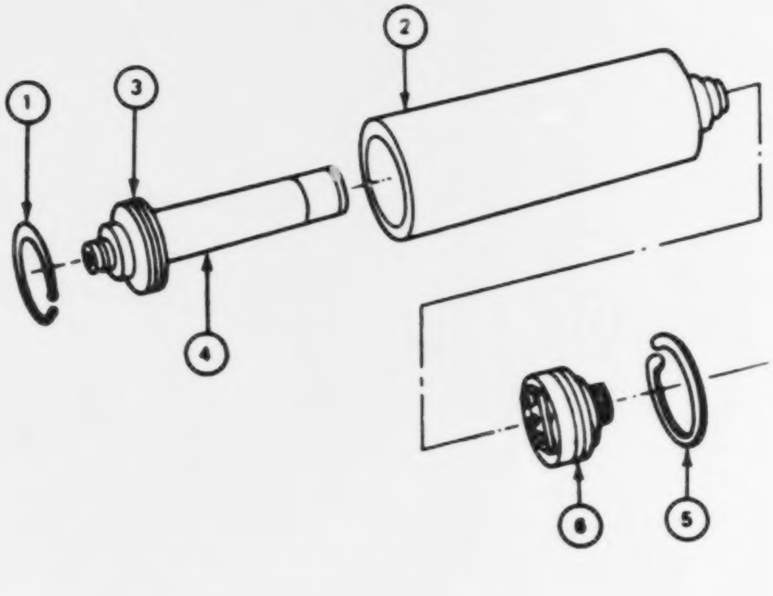
REFERENCES: JPG for procedures to:
Use retaining ring pliers
Remove preformed packing
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove manual elevation pump (para 13-54)
Remove hydraulic riser (para 13-14)
Remove oil filter (para 13-37)
Test oil filter (para 13-36)

13-39. OIL FILTER DISASSEMBLY PROCEDURE (CONT)

FRAME 1

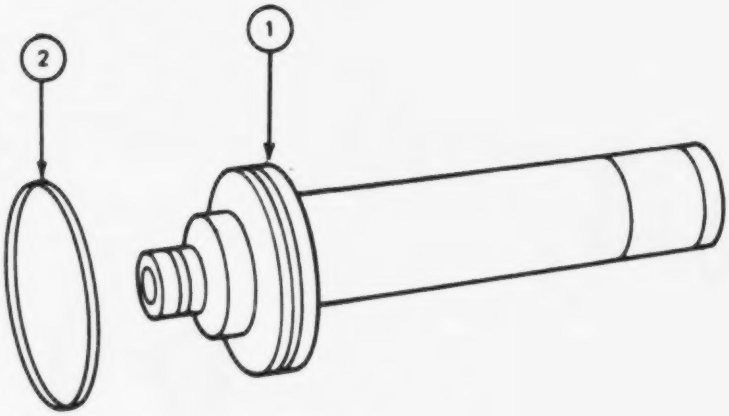
Step	Procedure
1.	Using retaining ring pliers, remove retaining ring (1) from oil filter (2) (JPG). **NOTE** Outlet end cap (3) and filter element (4) are removed as a unit.
2.	Using slip joint pliers, pull cap (3) and filter element (4) from oil filter (2).
3.	Using retaining ring pliers, remove retaining ring (5) from inlet end cap (6) of oil filter (2) (JPG).
4.	Using slip joint pliers, pull cap (6) from body of oil filter (2). GO TO FRAME 2



13-39. OIL FILTER DISASSEMBLY PROCEDURE (CONT)

FRAME 2

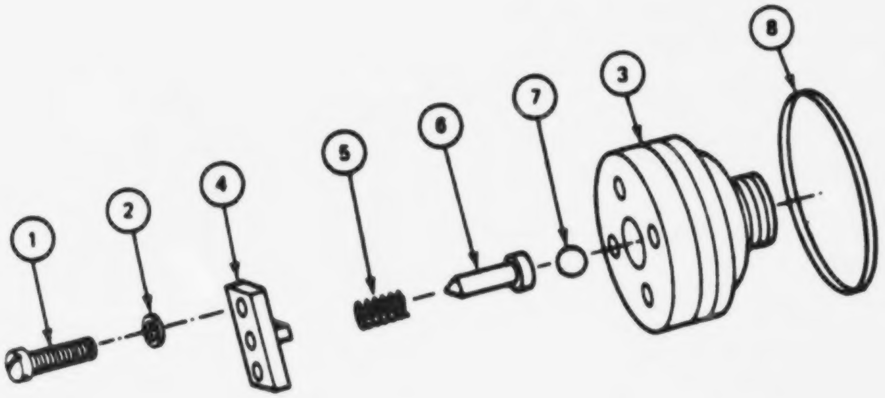
Step	Procedure
1.	Deleted.
2.	Deleted.
3.	Using O-ring extractor tool, remove preformed packing (2) from filter outlet end cap (1) (JPG). Throw away preformed packing. GO TO FRAME 3



13-39. OIL FILTER DISASSEMBLY PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Using Allen wrench, slowly remove two screws (1) and two lockwashers (2) from inlet end cap (3).
2.	Remove guide assembly (4), spring (5), guide (6), and ball (7) from inlet end cap (3).
3.	Using O-ring extractor tool, remove preformed packing (8) from inlet end cap (3) (JPG). Throw preformed packing away.
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK



13-40. OIL FILTER ASSEMBLY PROCEDURE

TOOLS: Internal retaining ring pliers
O-ring extractor kit

SUPPLIES: Preformed packing (two) (MS 28775-328)
Hydraulic fluid (item 10, App. A)
Lint-free cloths (item 21, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Install preformed packings
Install retaining rings

GENERAL INSTRUCTIONS:

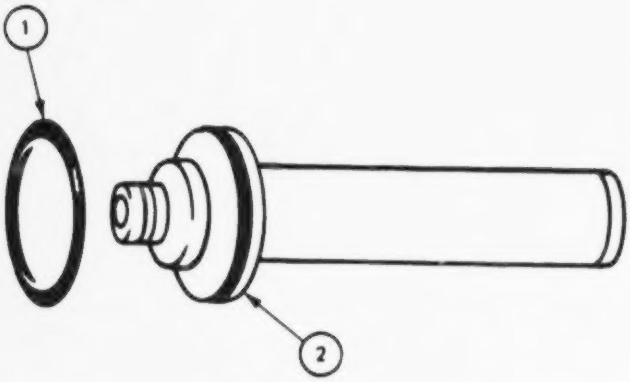
CAUTION

All hydraulic parts being assembled must be clean. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

13-40. OIL FILTER ASSEMBLY PROCEDURE (CONT)

FRAME 1

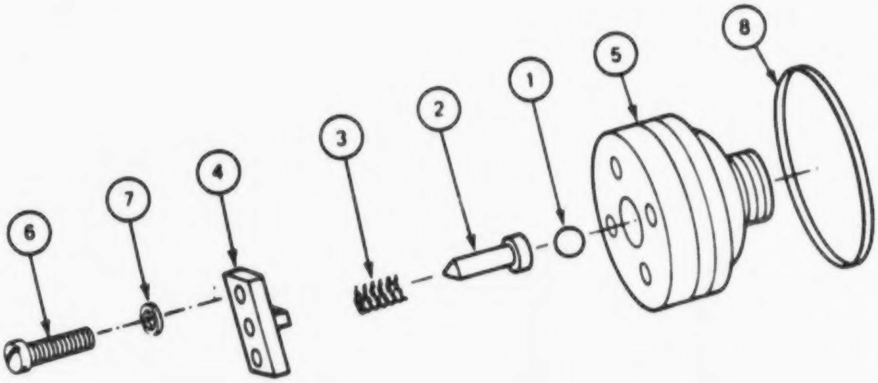
Step	Procedure
1.	Deleted.
2.	Lightly coat preformed packing (1) with hydraulic fluid.
3.	Using O-ring extractor tool, put preformed packing (1) on filter outlet end cap (2) (JPG). GO TO FRAME 2



13-40. OIL FILTER ASSEMBLY PROCEDURE (CONT)

FRAME 2

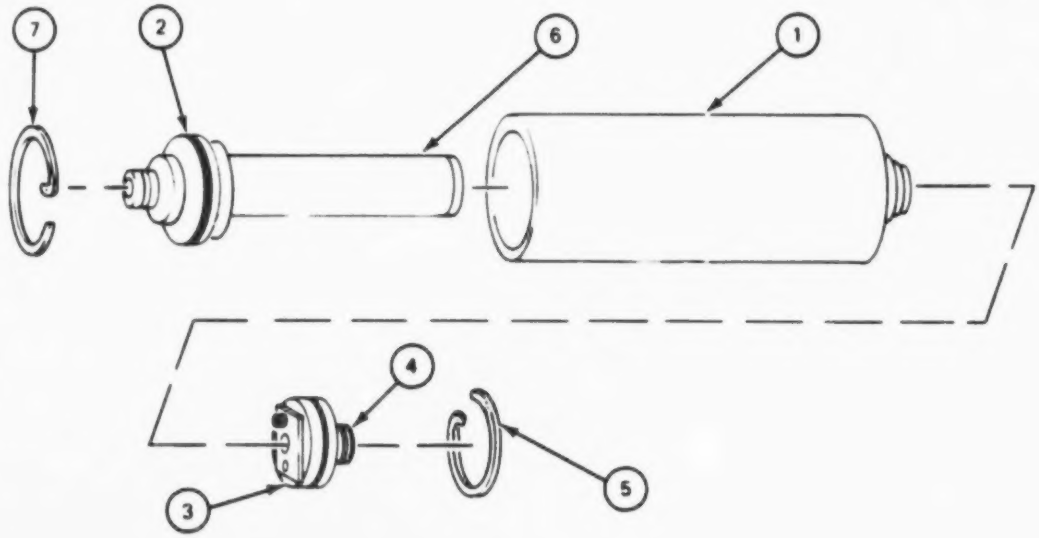
Step	Procedure
1.	Put ball (1), guide (2), spring (3), and guide assembly (4) into center of cap (5).
2.	Using Allen wrench, install two screws (6) and two lockwashers (7) through guide assembly (4) into cap (5).
3.	Lightly coat preformed packing (8) with hydraulic fluid.
4.	Using O-ring extractor tool, put preformed packing (8) on cap (5) (JPG).
	GO TO FRAME 3



13-40. OIL FILTER ASSEMBLY PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Lightly coat inside of oil filter (1) and preformed packings (2) and (3) with hydraulic fluid.
2.	Slide cap (4) into end of oil filter (1).
3.	Using pliers, install retaining ring (5) in oil filter (1) groove (JPG).
4.	Slide cap (6) into oil filter (1).
5.	Using pliers, install retaining ring (7) in oil filter (1) groove (JPG).
	NOTE Follow-on Maintenance Action Required: Test oil filter (para 13-36). END OF TASK



Section 9. OIL RESERVOIR

13-41. MAINTENANCE PROCEDURES INDEX

	Tasks			
Equipment Item	Removal	Installation	Disassembly	Assembly
Oil Reservoir	13-42	13-43	13-44	13-45

13-42. OIL RESERVOIR REMOVAL PROCEDURE

TOOLS: 5/16" socket head screw key (Allen wrench)
O-ring extractor kit

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: TM 9-9-2350-257-20-2-3 for procedures to remove fluid strainer
JPG for procedures to:
- Remove preformed packing
- Clean parts
- Inspect and repair parts

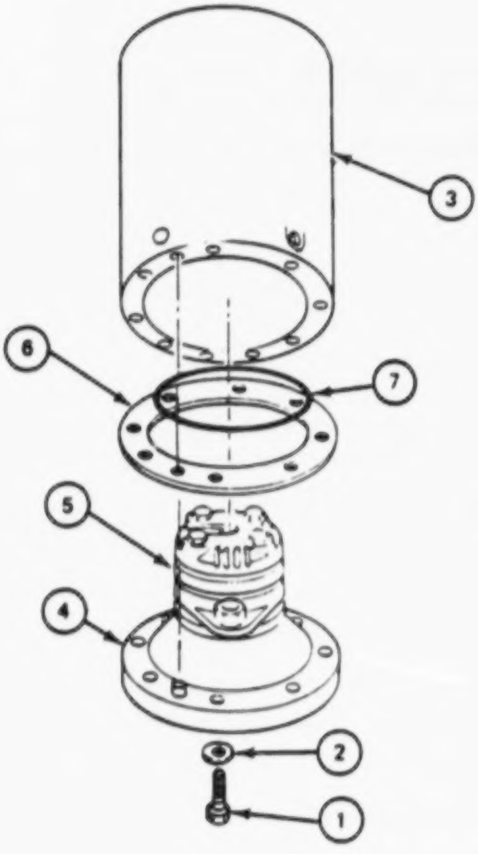
EQUIPMENT CONDITION: Fluid strainer removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Remove power pack (para 13-3)
Remove hydraulic riser (para 13-14)
Remove electric drive motor (para 13-50)
Remove oil filter (para 13-37)

13-42. OIL RESERVOIR REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using Allen wrench, remove four screws (1) and four lockwashers (2).
	CAUTION Be careful to lift oil reservoir (3) straight up off mount (4). If reservoir is lifted at an angle, it could hit pump (5) and break it.
2.	Lift oil reservoir (3) straight up off mount (4).
	NOTE Do step 3 for mount (4) with gasket (6). Do step 4 for mount (4) with preformed packing (7).
3.	Remove gasket (6) from mount (4). Throw away gasket.
4.	Using O-ring extractor tool, remove preformed packing (7) from groove in mount (4) (JPG). Throw away preformed packing.
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK



13-43. OIL RESERVOIR INSTALLATION PROCEDURE

TOOLS: 5/16" socket head screw key (Allen wrench)
3/8" drive torque wrench (0-600 inch-pounds)
5/16" hex head socket (3/8" drive)

SUPPLIES: Gasket
Preformed packing (546899)

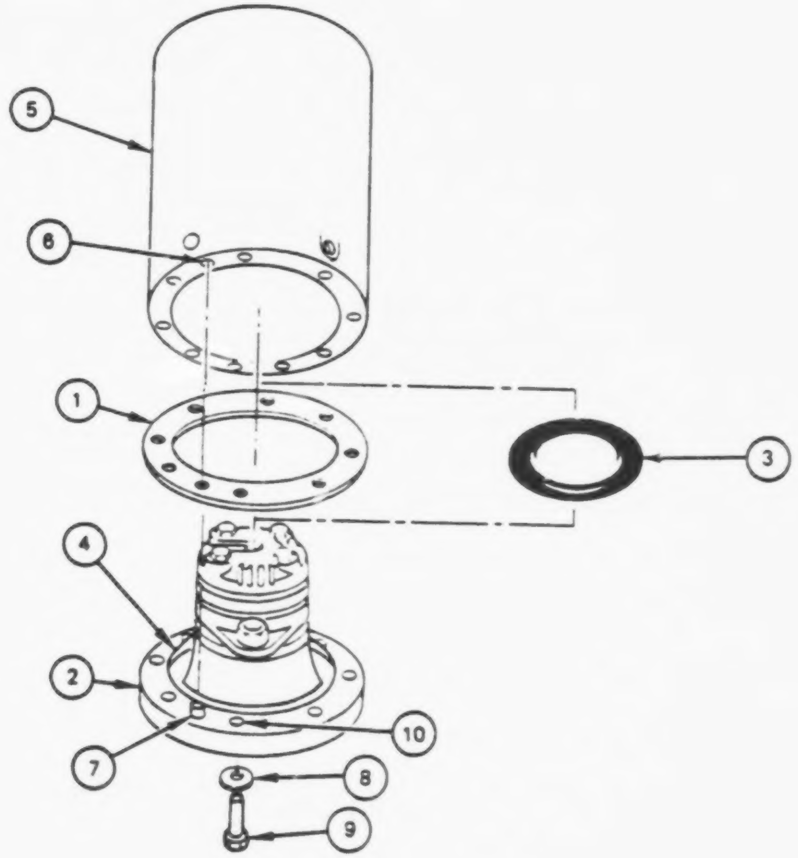
PERSONNEL: One

REFERENCES: JPG for procedure to use torque wrench
TM 9-2350-257-20-2-3 for procedure to install strainer

PRELIMINARY PROCEDURES: Assemble oil reservoir (para 13-45)

FRAME 1

Step	Procedure
	NOTE Do step 1 for mount (2) without groove (4). Do step 2 for mount (2) with groove (4).
1.	Put gasket (1) on flat surface of mount (2).
2.	Put preformed packing (3) in groove (4) of mount (2).
3.	Place oil reservoir (5) over mount (2).
4.	Line up small hole (6) with pin (7). Push oil reservoir (5) down on mount (2).
5.	Put four lockwashers (8) on four screws (9).
6.	Put four screws (9) in four large holes (10) in mount (2).
7.	Using Allen wrench, tighten four screws (9).
8.	Using torque wrench, tighten screws (9) to between 190 and 215 inch-pounds (JPG).
	NOTE Follow-on Maintenance Action Required: Install electric drive motor (para 13-51). Install oil filter (para 13-38). Install hydraulic riser (para 13-15). Install fluid strainer (TM-20-2-3). Install power pack (para 13-4).
	END OF TASK


5
6
1
3
4
2
10
7
8
9

Para 13-43 Cont

13-44. OIL RESERVOIR DISASSEMBLY PROCEDURE

TOOLS: 7/8" combination wrench
1" combination wrench
11/16" combination wrench
O-ring extractor kit
1-1/2" open end wrench
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

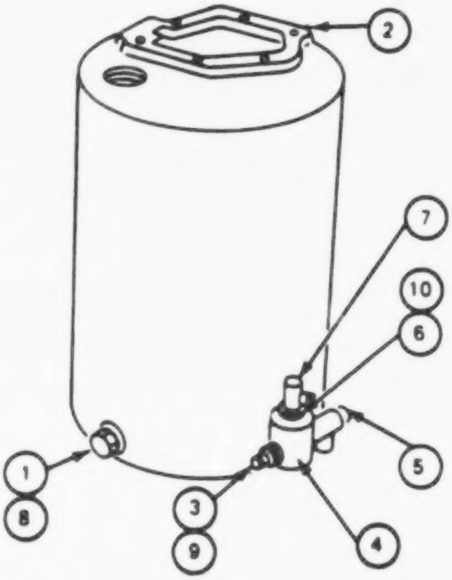
REFERENCES: JPG for procedures to:
Remove preformed packings
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove power pack (para 13-3)
Remove hydraulic riser (para 13-14)
Remove electric drive motor (para 13-50)
Remove oil filter (para 13-37)
Remove oil reservoir (para 13-42)

13-44. OIL RESERVOIR DISASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using 11/16" combination wrench, remove plug (1) from oil reservoir (2).
2.	Using 11/16" combination wrench, remove nipple (3) from tee (4).
3.	Using 11/16" combination wrench, remove drain cock (5) from tee (4).
4.	Using 1-1/2" open end wrench, remove tee (4) from oil reservoir (2).
5.	Using 1" combination and 1-1/2" open end wrenches, loosen nut (6).
6.	Using 7/8" combination wrench, remove tee (7) from tee (4).
7.	Using O-ring extractor tool, remove preformed packing (8) from plug (1) (JPG). Throw preformed packing away.
8.	Using O-ring extractor tool, remove preformed packing (9) from nipple (3) (JPG). Throw preformed packing away.
9.	Using O-ring extractor tool, remove preformed packing (10) from tee (7) (JPG). Throw preformed packing away.
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK



13-45. OIL RESERVOIR ASSEMBLY PROCEDURE

TOOLS: 7/8" combination wrench
1" combination wrench
1-1/2" open end wrench
11/16" combination wrench
O-ring extractor kit

SUPPLIES: Preformed packing (MS 28778-4)
Preformed packing (MS 28778-10)
Preformed packing (MS 28778-6)
Lint-free cloths (item 21, App. A)
Hydraulic fluid (item 10, App. A)

PERSONNEL: One

REFERENCES: JPG for procedure to install preformed packing

GENERAL INSTRUCTIONS:

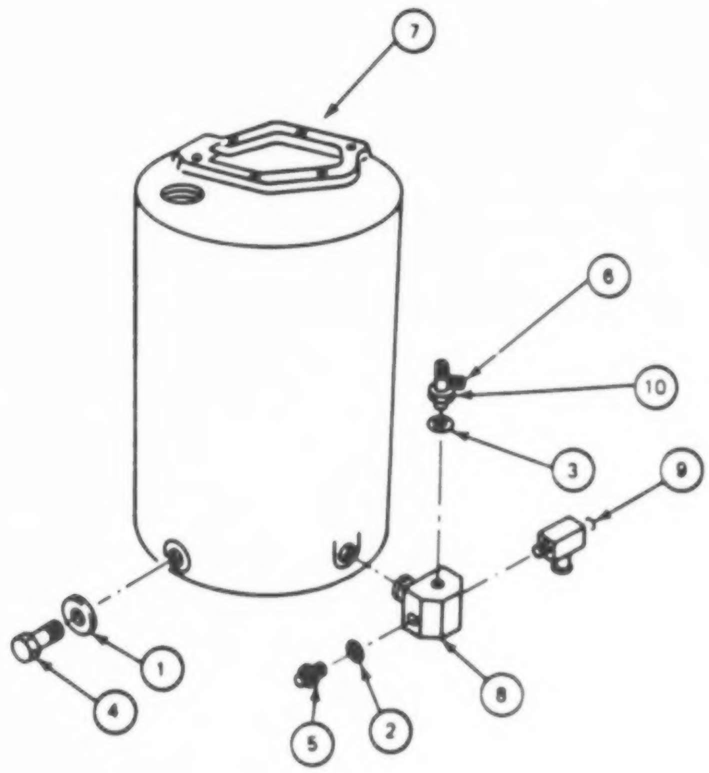
CAUTION

Hydraulic parts must be protected from dirt during assembly. Dirt can damage hydraulic parts. Use lint-free cloths to keep hydraulic parts clean.

13-45. OIL RESERVOIR ASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Coat three preformed packings (1), (2) and (3) with hydraulic fluid.
2.	Using O-ring extractor tool, put preformed packing (1) on plug (4). (JPG).
3.	Using O-ring extractor tool, put preformed packing (2) on nipple (5) (JPG).
4.	Using O-ring extractor tool, put preformed packing (3) on tee (6) (JPG).
5.	Using 11/16" wrench, put plug (4) in oil reservoir (7).
6.	Using 11/16" combination wrench, put nipple (5) in tee (8).
7.	Using 11/16" combination wrench, put drain cock (9) in tee (8).
8.	Using 7/8" combination wrench, put tee (6) in tee (8) and turn tee (6) until fitting end faces toward drain cock (9).
9.	Using 1-1/2" open end wrench, put tee (8) in reservoir (7).
10.	Using 7/8" and 1" combination wrenches, tighten nut (10).
	NOTE Follow-on Maintenance Action Required: Install oil reservoir (para 13-43). END OF TASK



Section 10. HYDRAULIC PUMP AND MOTOR MOUNT

13-46. MAINTENANCE PROCEDURES INDEX

	Tasks	
Equipment Item	Removal	Installation
1. Hydraulic Pump	13-47	13-48
2. Motor Mount	13-47	13-48

13-47. HYDRAULIC PUMP AND MOTOR MOUNT REMOVAL PROCEDURE

TOOLS: 9/16" combination wrench
1/8" socket head screw key (Allen wrench)
8 ounce ball peen hammer
1/4" drive pin punch
O-ring extractor kit
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

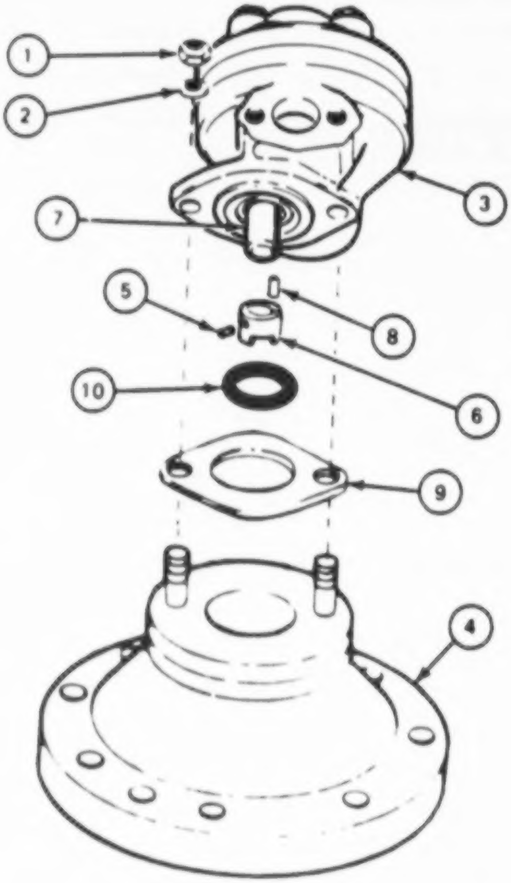
REFERENCES: JPG for procedures to:
Remove preformed packing
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove power pack (para 13-3)
Remove hydraulic riser (para 13-14)
Remove electric motor (para 13-50)
Remove oil reservoir (para 13-42)

13-47. HYDRAULIC PUMP AND MOTOR MOUNT REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using combination wrench, remove two nuts (1), two lockwashers (2), and pump (3) from pump mount (4).
2.	Using Allen wrench, remove setscrew (5) from coupling (6).
3.	Remove coupling (6) from shaft (7) of pump (3).
4.	Using hammer and punch, remove key (8) from shaft (7).
	NOTE Do step 5 for pump mount (4) with gasket (9). Do step 6 for pump mount (4) with preformed packing (10).
5.	Remove gasket (9) from motor mount (4). Throw away gasket.
6.	Using O-ring extractor tool, remove preformed packing (10) from groove in pump mount (4). Throw away preformed packing.
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK



13-48. HYDRAULIC PUMP AND MOTOR MOUNT INSTALLATION PROCEDURE

TOOLS: 1/8'' socket head screw key (Allen wrench)
Feeler gauge
9/16'' combination wrench
8 ounce ball peen hammer
1/4'' drive pin punch

SUPPLIES: Parts kit (5703523)
Preformed packing (MS 25775-228)

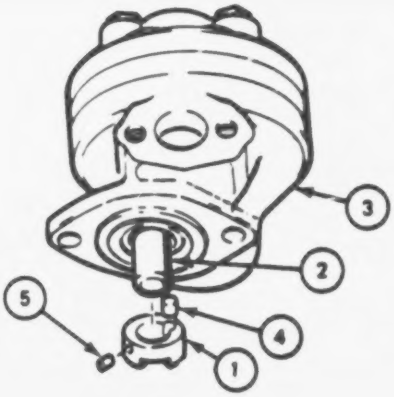
PERSONNEL: One

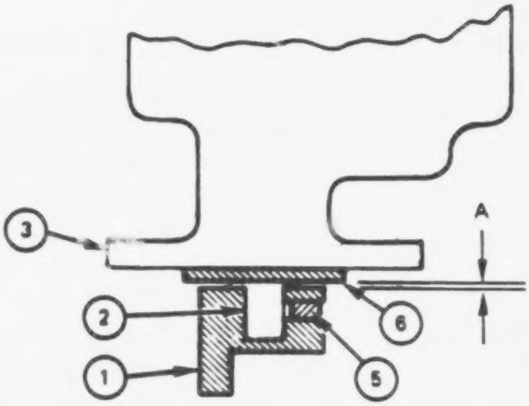
REFERENCES: JPG for procedures to:
Use torque wrench
Use feeler gauge

13-48. HYDRAULIC PUMP AND MOTOR MOUNT INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Put coupling (1) on shaft (2) of pump (3). Align key slots of coupling and shaft.
2.	Using hammer and punch, put key (4) in key slots of coupling (1) and shaft (2).
3.	Using Allen wrench, put setscrew (5) in coupling (1). Do not tighten setscrew.
4.	Using feeler gauge, slide coupling (1) up and down on shaft (2) until gap A between base (6) of pump (3) and end of coupling (1) is between 0.016" and 0.031" (JPG).
5.	Using Allen wrench, tighten setscrew (5).
	GO TO FRAME 2

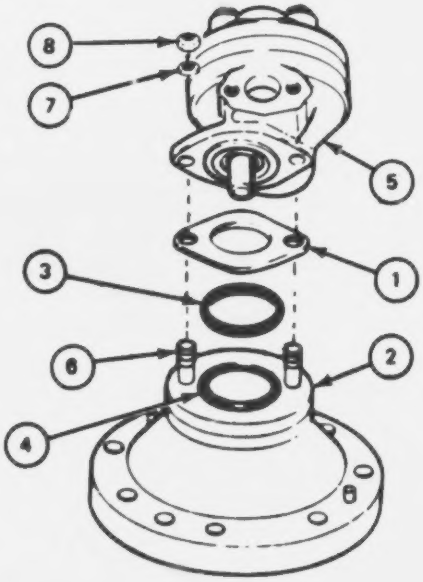




13-48. HYDRAULIC PUMP AND MOTOR MOUNT INSTALLATION PROCEDURE (CONT)

FRAME 2

Step	Procedure
	NOTE Do step 1 if pump mount (2) does not have groove (4). Do step 2 for pump mount (2) with groove (4).
1.	Put new gasket (1) on flat surface of pump mount (2).
2.	Put preformed packing (3) in groove (4) of pump mount (2).
3.	Put mounting flange of pump (5) over two studs (6) and on pump mount (2).
4.	Using combination wrench, attach pump (5) to two studs (6) on pump mount (2) with two lockwashers (7) and two nuts (8).
	NOTE Follow-on Maintenance Action Required: Install oil reservoir (para 13-43).
	END OF TASK



Section 11. ELECTRIC DRIVE MOTOR

13-49. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks Removal	Installation
Electric Drive Motor	13-50	13-51

13-50. ELECTRIC DRIVE MOTOR REMOVAL PROCEDURE

TOOLS: 9/16" combination wrench
Adjustable hook spanner wrench
5/32" socket head screw key (Allen wrench)
Hoist (200 pounds)
Metal scribe

SUPPLIES: 2"x2"x6" wood blocks (two)
3/4" rope sling (used with hoist to lift motor)

PERSONNEL: Three (Including hoist operator)

REFERENCES: TM 9-2350-257-10 for procedures to:
Traverse turret
Set turrt lock to LOCKED and UNLOCKED
JPG for procedure to disconnect electrical connectors
TM 9-2350-257-20-2-3 for procedures to:
Remove gunner's footrest plate
Remove turret power relay box
Remove motor mounting bracket

EQUIPMENT LOCATION INFORMATION:

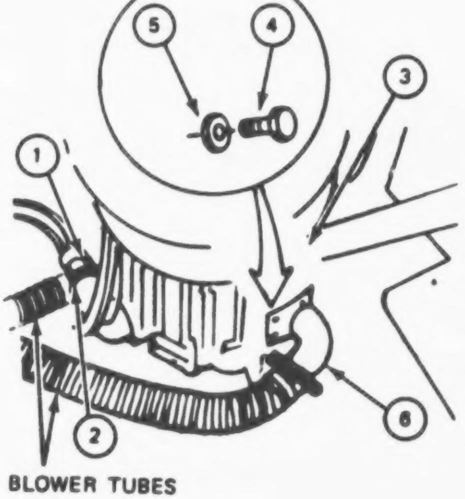
EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Turret Traverse Lock	FO-4	6
Power Pack	FO-1	18

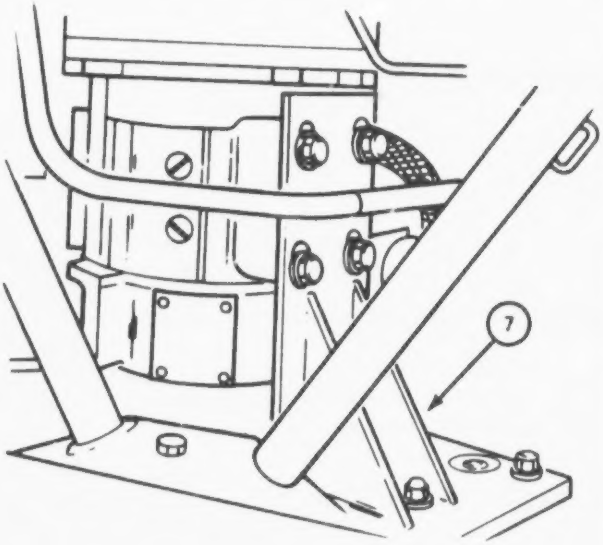
EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Gunner's footrest plate removed (TM-20-2-3)
Turret power relay box removed (TM-20-2-3)
Turret traverse lock set to UNLOCKED (TM-10)

13-50. ELECTRIC DRIVE MOTOR REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using spanner wrench, disconnect electrical connector (1) from elbow connector (2) on motor (3) (JPG).
2.	Using Allen wrench, remove eight screws (4) and eight lockwashers (5) that attach two blower tube ducts (6) to motor (3).
3.	Manually traverse turret until motor mounting bracket (7) can be reached from driver's compartment (TM-10).
4.	Set turret traverse lock to LOCKED (TM-10).
5.	Remove motor mounting bracket (7) (TM-20-2-3).
	GO TO FRAME 2

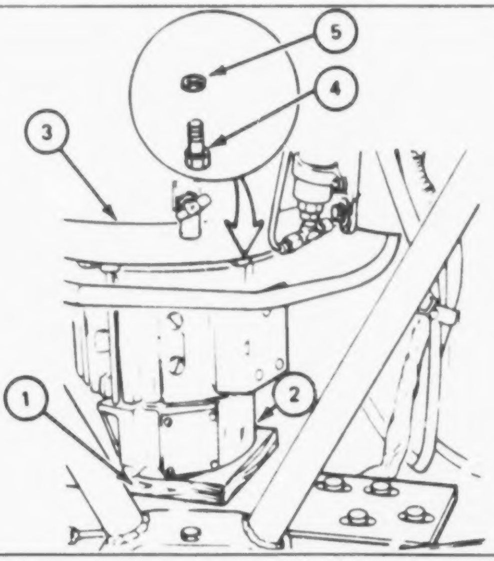




13-50. ELECTRIC DRIVE MOTOR REMOVAL PROCEDURE (CONT)

FRAME 2

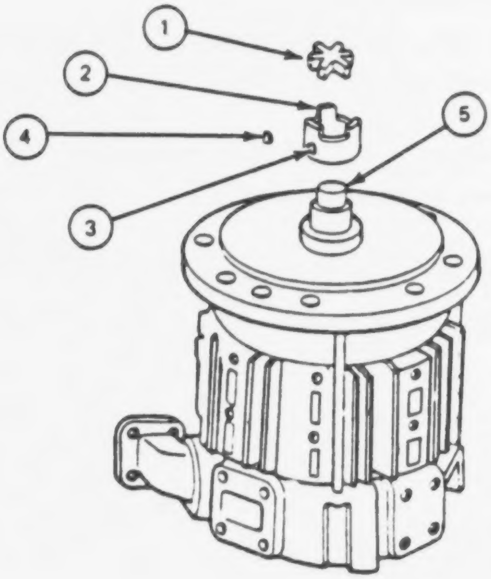
Step	Procedure
	WARNING Motor weights 77 pounds. Do not put fingers under motor. You could be hurt. Two soldiers are needed to remove and lift motor.
	CAUTION Do not put wood blocks (1) under bearing hump at center of motor. Bearing could be damaged.
1.	Place two wood blocks (1) under motor (2).
2.	Using scribe, put line across motor (2) and pump mount (3) to aid installation.
3.	Using 9/16" combination wrench, remove four screws (4) and four lockwashers (5) that attach motor (2) to pump mount (3).
4.	Carefully remove blocks (1) one at a time and lower motor (2).
5.	Slide motor (2) out from under pump mount (3).
	GO TO FRAME 3



13-50. ELECTRIC DRIVE MOTOR REMOVAL PROCEDURE (CONT)

FRAME 3

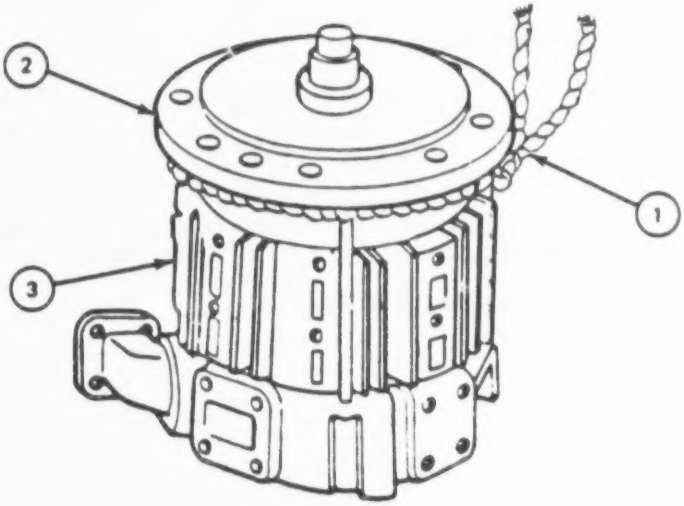
Step	Procedure
1.	Using fingers, remove spider insert (1) from motor coupling (2).
2.	Using Allen wrench, loosen setscrew (3) on side of motor coupling (2).
3.	Remove motor coupling (2) and woodruff key (4) from motor shaft (5).
	GO TO FRAME 4



13-50. ELECTRIC DRIVE MOTOR REMOVAL PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Tie rope sling (1) under and around motor drive head (2). Secure rope to hoist. **WARNING** Motor weighs 77 pounds. Be careful when lifting it. If motor drops or sways, it could hurt you.
2.	Soldier A and Soldier B: Place hoist over cupola hatch.
3.	Soldier C: Hold sides of motor (3).
4.	Soldier A and Soldier B: Using hoist, lift motor out of vehicle.
	END OF TASK



13-51. ELECTRIC DRIVE MOTOR INSTALLATION PROCEDURE

TOOLS: Hoist (to lift 200 pounds)
3/8" drive ratchet
9/16" socket (3/8" drive)
Adjustable hook spanner wrench
5/32" socket head screw key (Allen wrench)
6" steel rule (1/64" graduations)
12" straight edge (part of combination square)
3/8" drive torque wrench (0 to 600 inch-pounds)
8 ounce ball peen hammer

SUPPLIES: 3/4" rope sling (used with hoist to lift motor)
(2"x2"x6") wood blocks (three)
Paper
Pencil

PERSONNEL: Four (including hoist operator)

REFERENCES: TM 9-2350-257-10 for procedures to:
- Traverse turret
- Set turret traverse lock to LOCKED and UNLOCKED

JPG for procedures to:
- Connect electrical connector
- Use torque wrench

TM 9-2350-257-20-2-3 for procedures to:
- Install motor mounting bracket
- Install gunner's footrest plate
- Install turret power relay box

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Turret Traverse Lock	FO-4	6
Power Pack	FO-1	18

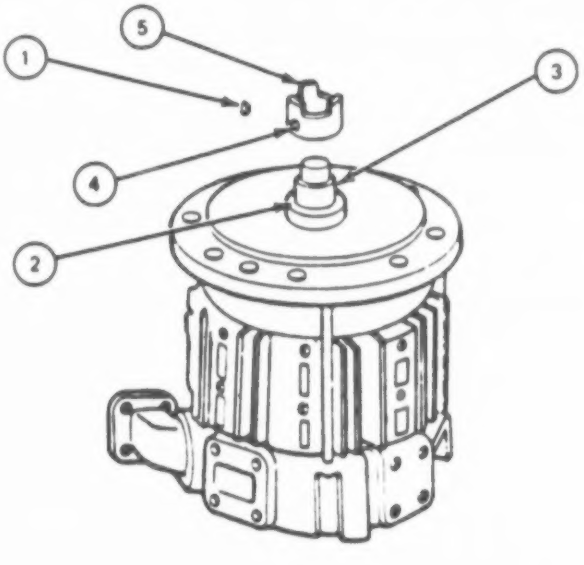
EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Turret traverse lock set to UNLOCKED (TM-10)

PRELIMINARY PROCEDURES: Install hydraulic pump (para 13-48)

13-51. ELECTRIC DRIVE MOTOR INSTALLATION PROCEDURE (CONT)

FRAME 1

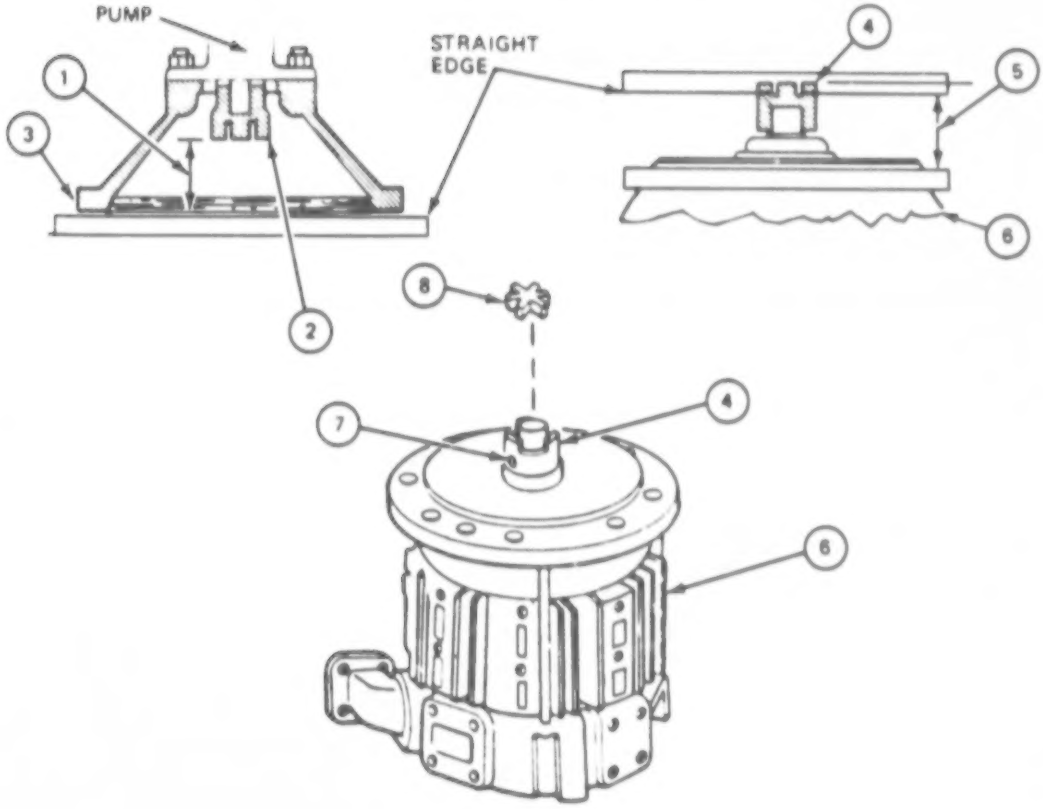
Step	Procedure
1.	Using hammer, tap woodruff key (1) in slot (2) on motor shaft (3).
2.	Using Allen wrench, loosen setscrew (4) in motor coupling (5).
3.	Put motor coupling (5) on motor shaft (3).
	GO TO FRAME 2



13-51. ELECTRIC DRIVE MOTOR INSTALLATION PROCEDURE (CONT)

FRAME 2

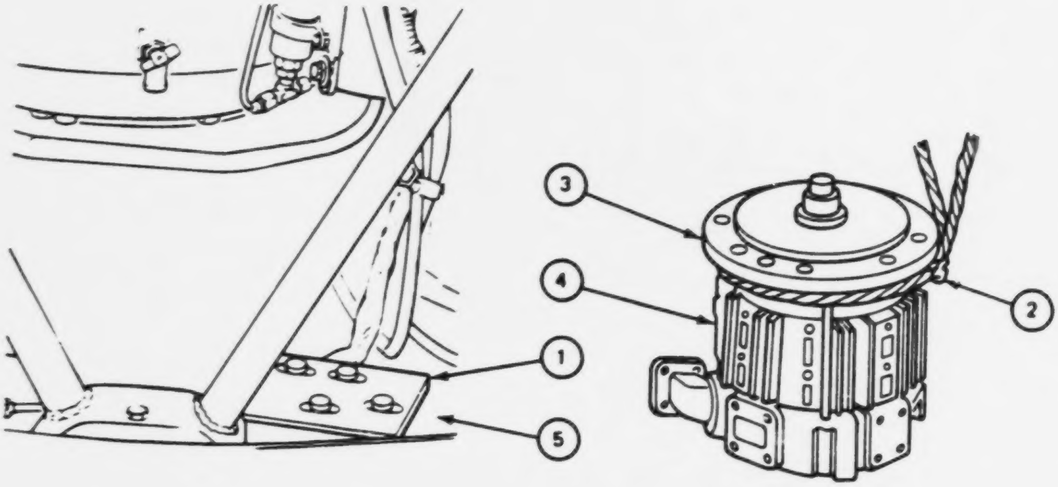
Step	Procedure
1.	Using straight edge and steel rule, measure distance (1) between bottom of pump coupling (2) and bottom of pump mount (3).
2.	Using pencil and paper, write down distance (1) measured in Step 1.
3.	Put straight edge in splines of motor coupling (4).
	NOTE Motor coupling (4) must be installed an exact distance (5) from electric drive motor (6) before motor is installed on pump mount (3).
4.	Using steel rule to measure, move motor coupling (4) until distance (5) is between 1/64 and 1/32" less than distance measured in step 1.
5.	Using Allen wrench, tighten setscrew (7).
6.	Put spider insert (8) in motor coupling (4).
	GO TO FRAME 3


PUMP
STRAIGHT EDGE

13-51. ELECTRIC DRIVE MOTOR INSTALLATION PROCEDURE (CONT)

FRAME 3

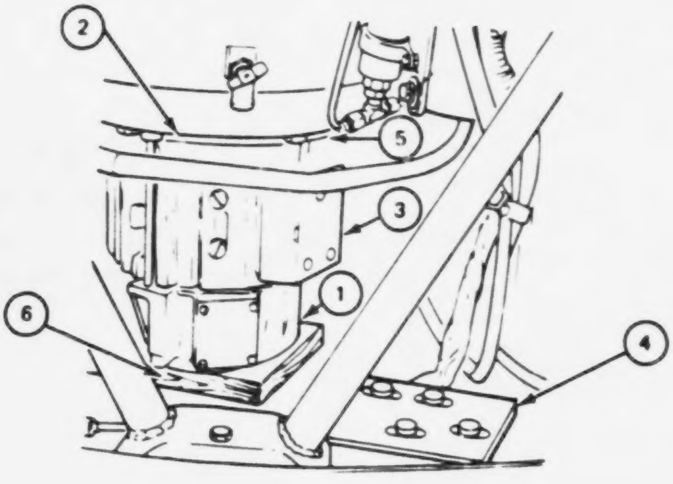
Step	Procedure
1.	Soldier A: Manually traverse turret until motor mounting plate (1) can be reached from driver's compartment (TM-10).
2.	Set turret traverse lock to LOCKED (TM-10).
3.	Soldier B: Tie rope sling (2) under and around motor drive head (3). Secure rope to hoist. **WARNING** Motor weighs 77 pounds. Be careful when lifting and lowering it. If motor drops or sways, it could hurt you.
4.	Soldier B and C: Slowly lower motor into vehicle.
5.	Soldier A: Hold motor on sides (4). Guide motor down to turret platform (5).
6.	Remove rope sling (2) from motor (4). GO TO FRAME 4



13-51. ELECTRIC DRIVE MOTOR INSTALLATION PROCEDURE (CONT)

FRAME 4

Step	Procedure
	WARNING Be careful to lift motor with knees bent, back straight. Lifting wrong can hurt you.
1.	Soldier A and Soldier B: Slide motor (1) under pump mount (2) with bracket mounting side (3) facing motor mounting plate (4).
	CAUTION Do not put wood blocks under bearing hump at center of motor.
2.	Grab motor under drive head (5). Lift motor up about 2" and align scribe marks made during removal.
3.	Soldier C: Slide two wood blocks (6) under motor for support.
4.	Soldier A and Soldier B: Lower motor (1) on wood blocks (6).
	GO TO FRAME 5



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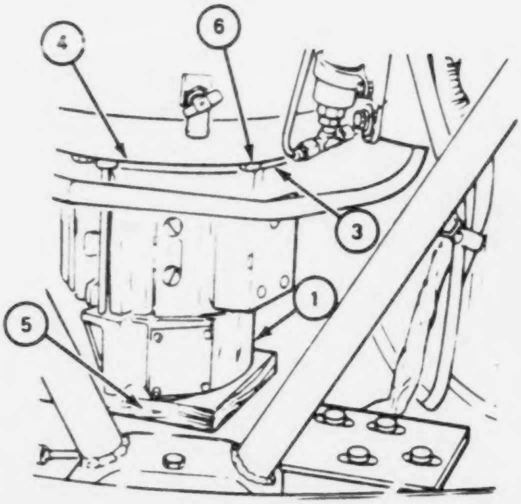
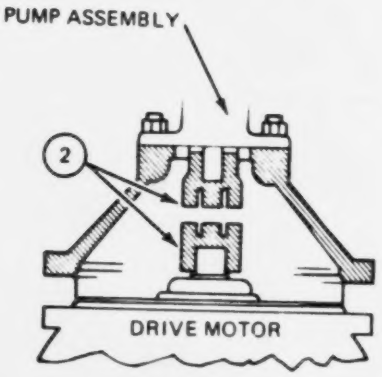
13-51. ELECTRIC DRIVE MOTOR INSTALLATION PROCEDURE (CONT)

FRAME 5

Step	Procedure
	CAUTION Motor (1) must be lifted and turned carefully to keep from breaking motor parts.
1.	Soldier A and Soldier B: Lift motor (1) about 1/2".
2.	Soldier C: Turn motor (1) until shaft couplings (2) line up.
3.	Soldier A and Soldier B: Lift motor (1) until drive head (3) is flat against pump mount (4).
4.	Soldier C: Slide third wood block (5) under motor (1) to hold it against pump mount (4).
5.	Turn motor (1) until four mounting holes (6) are lined up.
	GO TO FRAME 6

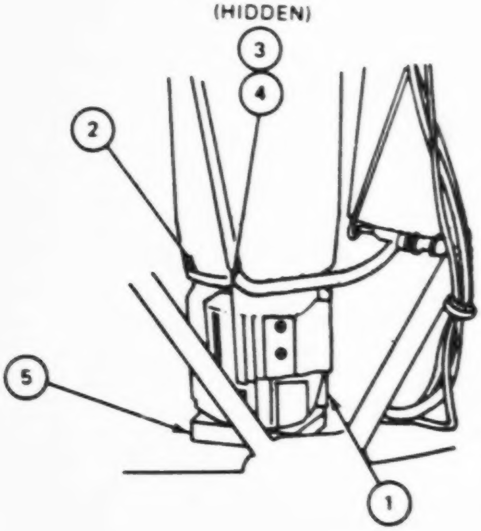




13-51. ELECTRIC DRIVE MOTOR INSTALLATION PROCEDURE (CONT)

FRAME 6

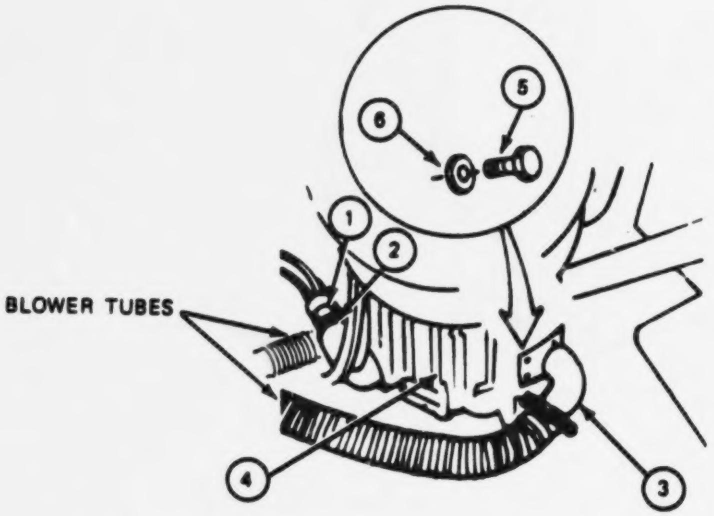
Step	Procedure
1.	Using socket wrench, attach motor (1) to pump mount (2) with four screws (3) and four lockwashers (4).
	NOTE
	Do step 2 only if power pack was removed from vehicle.
2.	Using torque wrench, tighten four screws (3) to between 205 and 225 inch-pounds (JPG).
3.	Install motor mounting bracket (TM-20).
4.	Remove wood blocks (5).
	GO TO FRAME 7



13-51. ELECTRIC DRIVE MOTOR INSTALLATION PROCEDURE (CONT)

FRAME 7

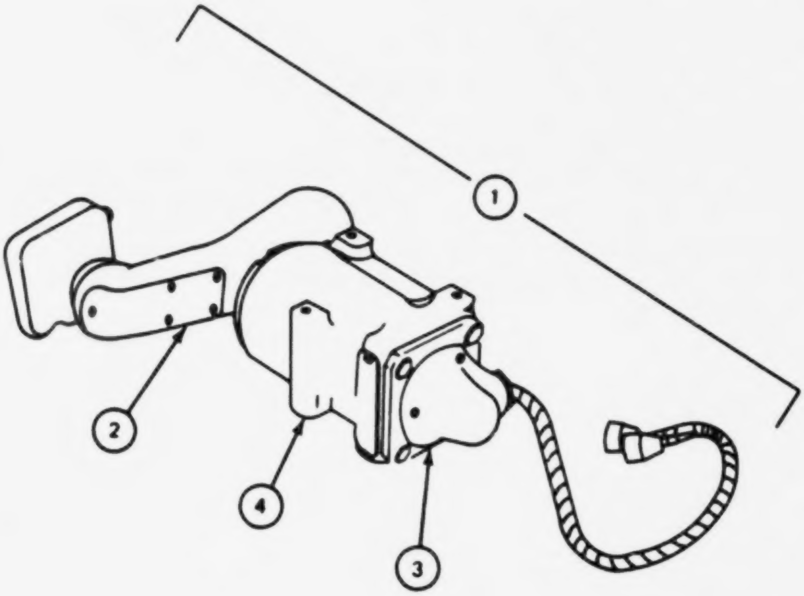
Step	Procedure
1.	Using spanner wrench, connect electrical connector (1) to elbow conntector (2) (JPG).
2.	Using Allen wrench, atach two air blower ducts (3) to motor (4) with eight screws (5) and eight lockwashers (6).
	NOTE Follow-on Maintenance Action Required: Install turret power relay box (TM-20-2-3). Install gunner's footrest plate (TM-20-2-3). Traverse turret in power mode to make sure motor works properly (TM-10).
	END OF TASK



Section 12. MANUAL ELEVATION PUMP

13-52. MAINTENANCE PROCEDURES INDEX

	TASKS						
Equipment Item	Inspection	Test	Removal	Installation	Disassembly	Assembly	Repair
1. Manual Elevation Pump	. . .	13-53	13-54	13-55	13-56	13-57	. . .
2. Handle	13-58	. . .	13-59	13-60	13-61	13-62	. . .
3. Switch Housing	. . .	. . .	13-63	13-64	13-65	13-66	. . .
4. Axial Pistons Pump	13-67	. . .	. . .	. . .	13-68	13-69	13-70



13-53. MANUAL ELEVATION PUMP TEST PROCEDURE

TEST EQUIPMENT: Multimeter
M3 oil pump
Suitable hydraulic fittings, preformed packings, and tools
Watch with second hand
Test manifold (fabricated tool, item 16, App. B)
Graduated cylinder, MS 35943-4
Spring scale (0 to 25 pounds)
Pressure gauge (0 to 2000 psi)

TOOLS: 5/32" socket head screw key (Allen wrench)

SUPPLIES: Hydraulic fluid (item 10, App. A)
Container, one quart

PERSONNEL: One

REFERENCES: JPG for procedures to:
Use M3 oil pump
Remove and install preformed packings
Use multimeter

PRELIMINARY PROCEDURES: Remove manual elevation pump (para 13-54)

GENERAL INSTRUCTIONS:

NOTE

If normal indication is not obtained, replace bad part listed in Probable Fault column. Refer to section index (para 13-58) for replacement of bad part.

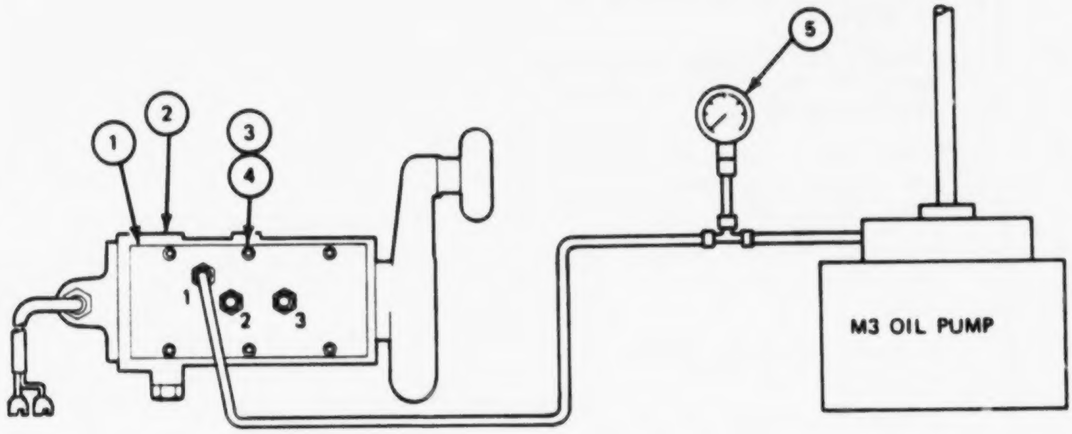
Suitable fittings, preformed packings, and tools should be used to connect test equipment to parts being tested.

13-53. MANUAL ELEVATION PUMP TEST PROCEDURE (CONT)

a. Leakage Test

FRAME 1

Step	Procedure	Normal Indication	Probable Fault
1.	Coat three preformed packings with hydraulic fluid.	. . .	. . .
2.	Put three preformed packings in grooves on back of test manifold (1).	. . .	. . .
3.	Using Allen wrench, attach test manifold (1) to manual elevation pump (2) with six screws (3) and six washers (4).	. . .	. . .
4.	Install three fittings in three ports of test manifold (1).	. . .	. . .
5.	Cap ports (2) and 3 of test manifold (1).	. . .	. . .
6.	Assemble M3 oil pump.	. . .	. . .
7.	Connect M3 oil pump and pressure gauge (5) to port 1 of test manifold (1).	. . .	. . .
	NOTE Keep handle of manual elevation pump (2) from turning when pump is pressurized.		
8.	Using M3 oil pump, pressurize manual elevation pump (2) to 1000 psi (JPG).	. . .	. . .
9.	Using watch, check pressure for one minute.	Pump (2) does not leak.	Bad preformed packings inside pump (2).
10.	Using M3 oil pump, reduce pressure to 0 psi (JPG).	. . .	. . .
11.	Remove M3 oil pump hose from port 1 of test manifold (1) and cap port 1.	. . .	. . .
	GO TO FRAME 2		

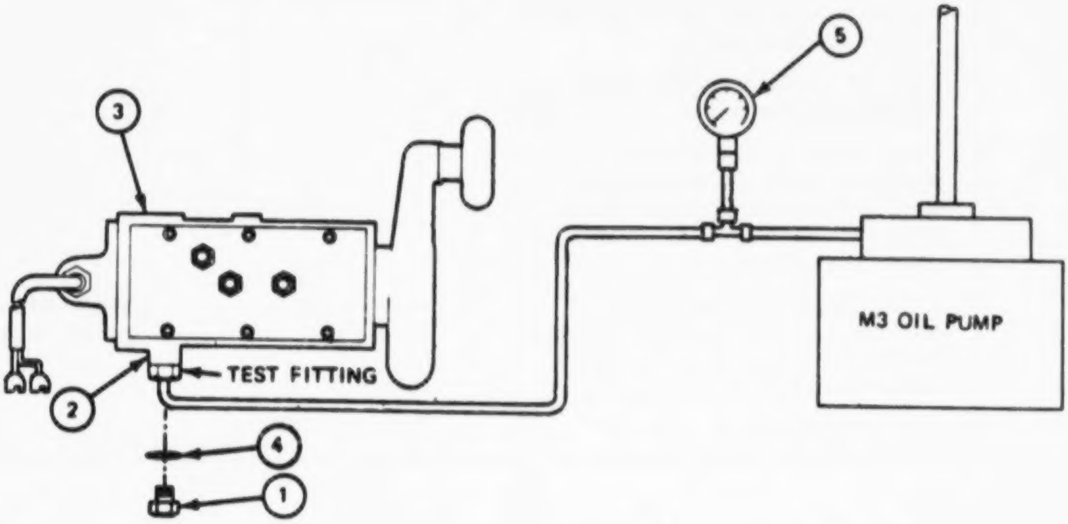

M3 OIL PUMP

13-53. MANUAL ELEVATION PUMP TEST PROCEDURE (CONT)

a. Leakage Test (Cont)

FRAME 2

Step	Procedure	Normal Indication	Probable Fault
1.	Remove plug (1) from port (2) of manual elevation pump (3).	. . .	. . .
2.	Remove preformed packing (4) from plug (1). Throw preformed packing away (JPG).	. . .	. . .
3.	Connect suitable test fitting with new preformed packing (4) in port (2).	. . .	. . .
4.	Connect M3 oil pump and pressure gauge (5) to port (2) of manual elevation pump (3).	. . .	. . .
5.	Using M3 oil pump, pressurize manual elevation pump (3) to about 78 psi (JPG).	. . .	. . .
6.	Using watch, check pressure for one minute.	Pump (3) does not leak.	Bad preformed packings inside pump (3).
7.	Using M3 oil pump, reduce pressure to 0 psi (JPG).	. . .	. . .
8.	Remove hose from port (2) of manual elevation pump (3).	. . .	. . .
9.	Coat new preformed packing (4) with hydraulic fluid.	. . .	. . .
10.	Remove test fitting from port (2).	. . .	. . .
11.	Put new preformed packing (4) on plug (1) (JPG).	. . .	. . .
12.	Put plug (1) with preformed packing (4) in port (2).	. . .	. . .
13.	Disassemble M3 oil pump.	. . .	. . .
	GO TO FRAME 3		

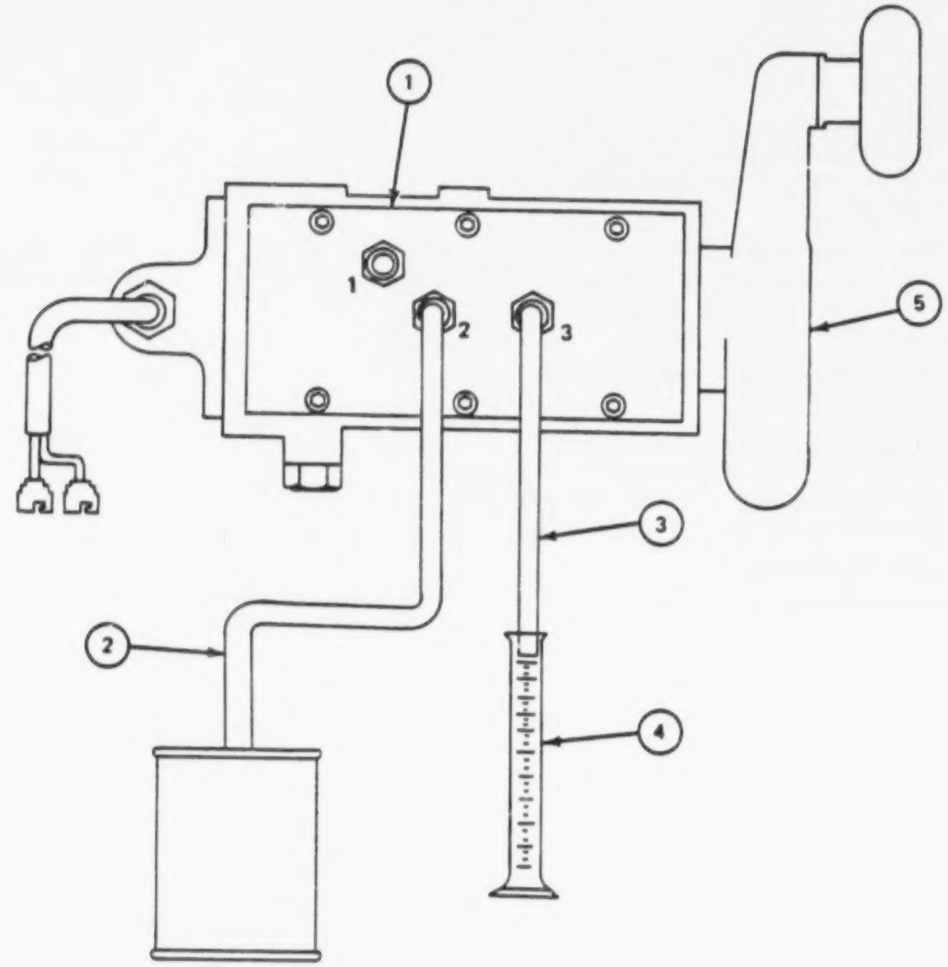

TEST FITTING
M3 OIL PUMP

13-53. MANUAL ELEVATION PUMP TEST PROCEDURE (CONT)

b. Volume Test

FRAME 3

Step	Procedure	Normal Indication	Probable Fault
1.	Uncap port 2 and port 3 of test manifold (1).	. . .	. . .
2.	Connect plastic tubing (2) to port 2 of test manifold (1).	. . .	. . .
3.	Put end of plastic tubing (2) in container of hydraulic fluid.	. . .	. . .
4.	Connect plastic tubing (3) to port 3 of test manifold (1).	. . .	. . .
5.	Put end of plastic tubing (3) in graduated cylinder (4).	. . .	. . .
6.	Turn handle (5) of manual elevation pump counterclockwise until hydraulic fluid comes out of tube (3) in steady stream into graduated cylinder (4).	. . .	. . .
7.	Using graduated cylinder (4), measure how much fluid is pumped out by one full turn of handle (5) counterclockwise.	From 9.0 ml to 13.0 ml.	Worn pistons or piston block.
	GO TO FRAME 4		

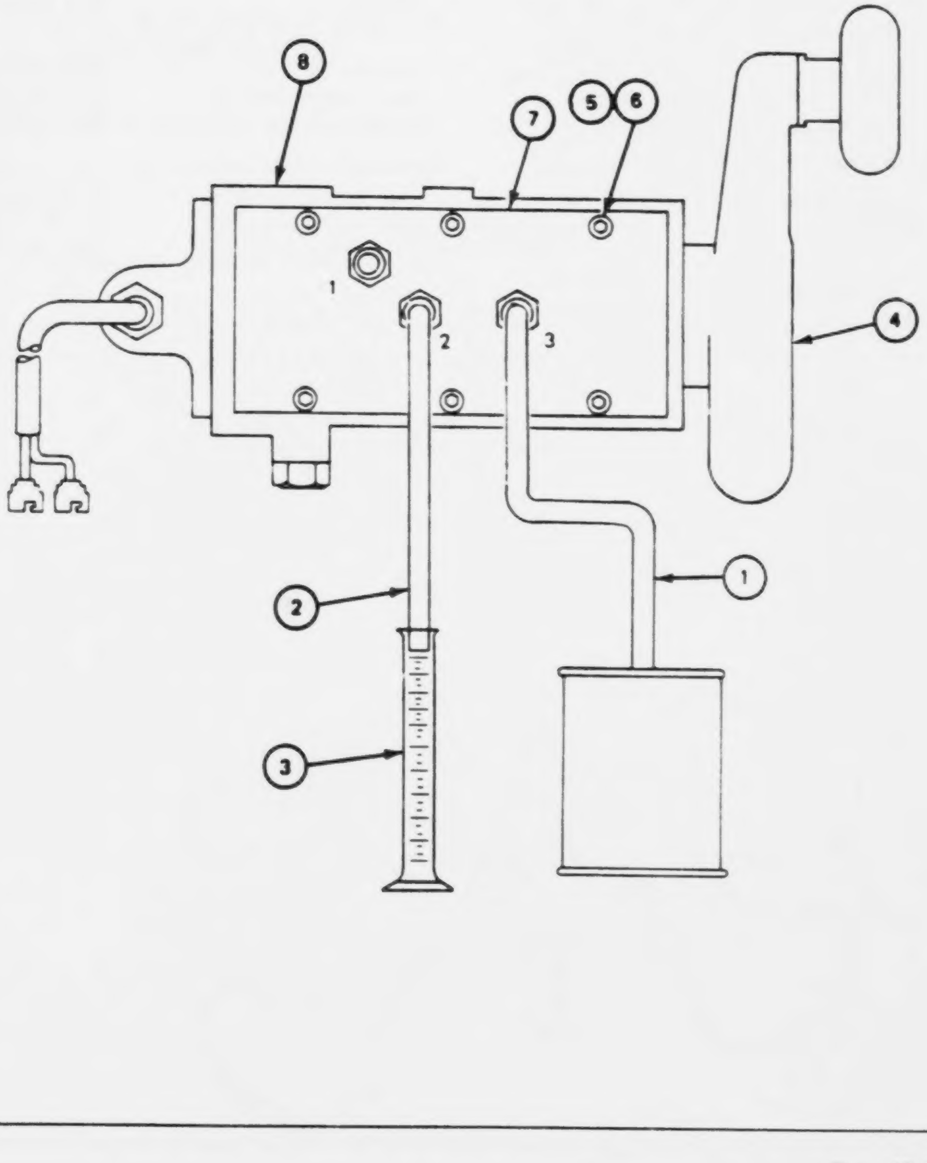


13-53. MANUAL ELEVATION PUMP TEST PROCEDURE (CONT)

b. **Volume Test (Cont)**

FRAME 4

Step	Procedure	Normal Indication	Probable Fault
1.	Put tubing (1) in container of hydraulic fluid.	. . .	. . .
2.	Put tubing (2) in graduated cylinder (3).	. . .	. . .
3.	Turn handle (4) clockwise until hydraulic fluid comes out of tubing (2) in steady stream into graduated cylinder (3).	. . .	. . .
4.	Using graduated cylinder (3), measure amount of fluid pumped out by one full turn of handle (4) clockwise.	From 9.0 ml to 13.0 ml.	Worn pistons or piston block.
5.	Remove tubing (1) and tubing (2) from ports 2 and 3.	. . .	. . .
6.	Using Allen wrench, remove six screws (5), and six washers (6), and test manifold (7) from manual elevation pump (8). GO TO FRAME 5	. . .	. . .

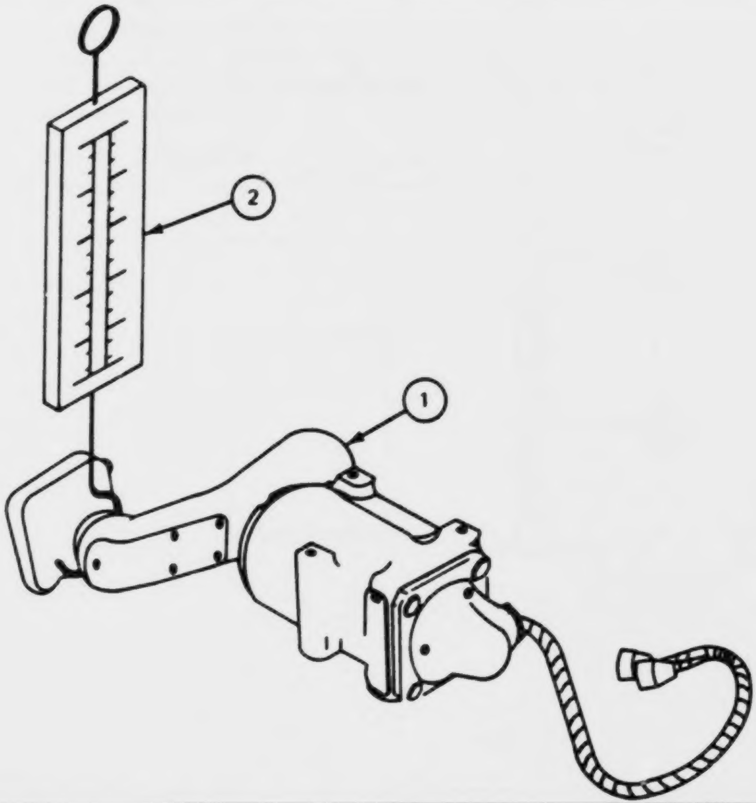


13-53. MANUAL ELEVATION PUMP TEST PROCEDURE (CONT)

c. Handle Torque Test

FRAME 5

Step	Procedure	Normal Indication	Probable Fault
1.	Using watch with second hand, turn manual elevation pump handle (1) clockwise at speed of one full turn per minute.	Handle (1) turns easily with smooth motion.	Bad piston in piston block or bad bearing.
2.	Using watch with second hand, turn manual elevation pump handle (1) counterclockwise at speed of one full turn per minute.	Handle (1) turns easily with smooth motion.	Bad piston in piston block or bad bearing.
3.	Using spring scale (2), pull on handle (1). GO TO FRAME 6	Handle (1) moves with force less than 10 pounds.	Bad piston in piston block or bad bearing.



13-53. MANUAL ELEVATION PUMP TEST PROCEDURE (CONT)

d. **Electrical Test**

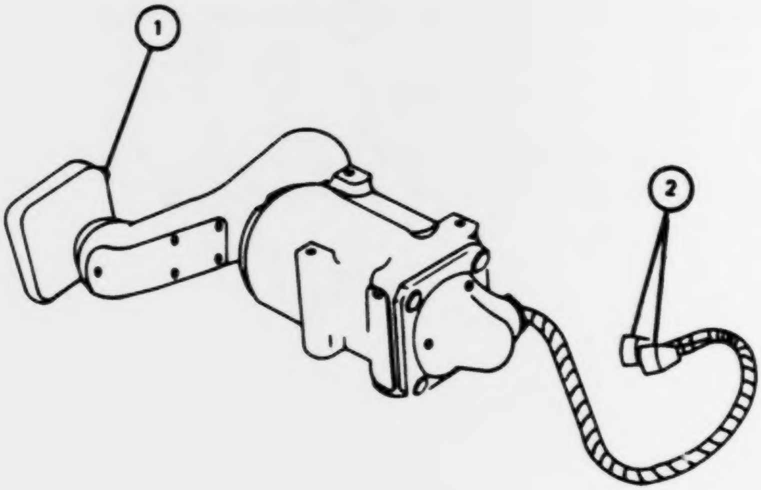
FRAME 6

Step	Procedure	Normal Indication	Probable Fault
1.	Make sure pushbutton (1) is not pushed in.	. . .	. . .
2.	Using multimeter, check continuity between switch leads (2).	Greater than 10 million ohms.	Bad trigger switch, bad wiring, or bad actuating linkage.
3.	Push in and hold pushbutton (1).	. . .	. . .
4.	Using multimeter, check continuity between two switch leads (2).	Less than 2 ohms.	Bad trigger switch, bad wiring, or bad actuating linkage.
5.	Remove multimeter from two leads (2).	. . .	. . .

NOTE

If normal indication was obtained in frames 1 through 6, manual elevation pump is good.

END OF TASK



13-54. MANUAL ELEVATION PUMP REMOVAL PROCEDURE

TOOLS: 5/32" socket head screw key (Allen wrench) 4" length

PERSONNEL: Two

REFERENCES: JPG for procedures to:
  Remove hydraulic packings
  Disconnect electrical connectors
  Plug hydraulic ports
TM 9-2350-257-20-2-3 for procedure to remove manual elevation accumulator
TM 9-2350-257-10 for procedures to:
  Manually traverse turret
  Set turret traverse lock

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Gunner's Control Box	FO-1	2
Power Pack	FO-1	18
Turret Traverse Lock	FO-4	6

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Gunner's control box ELEV/TRAV POWER switch set to OFF
Manual elevation accumulator removed (TM-20-2-3)

GENERAL INSTRUCTIONS:

CAUTION

Keep dirt from getting in parts. Dirt can damage equipment.

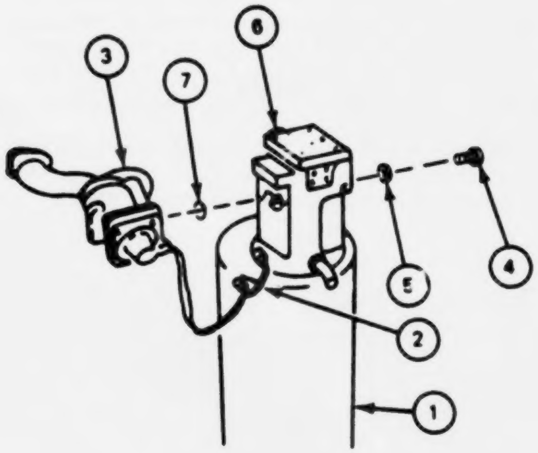
NOTE

Soldier A will be inside turret in gunner's area.
Soldier B will be inside driver's compartment.

13-54. MANUAL ELEVATION PUMP REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
	NOTE Soldier A does all steps except step 5.
1.	Manually traverse turret until back side of power pack (1) can be reached from driver's compartment (TM-10).
2.	Set turret traverse lock to LOCKED (TM-10).
3.	Disconnect two electrical connectors (2) (JPG).
4.	Hold manual elevation pump (3) during step 5.
5.	Soldier B: Using Allen wrench, remove six screws (4) and six lockwashers (5) that attach manual elevation pump (3) to hydraulic riser (6).
6.	Remove manual elevation pump (3) and three packings (7) (JPG).
7.	Plug three ports in hydraulic riser (6) (JPG).
8.	Plug three ports in manual elevation pump (3) (JPG).
	END OF TASK



13-55. MANUAL ELEVATION PUMP INSTALLATION PROCEDURE

TOOLS: 5/32" socket head screw key (Allen wrench) 4" length

SUPPLIES: Preformed packing MS 28775-10 (three)
Hydraulic fluid (item 10, App. A)

PERSONNEL: Two

REFERENCES: JPG for procedures to:
- Install hydraulic packings
- Connect electrical connectors

TM 9-2350-257-10 for procedures to:
- Set turret traverse lock
- Manually traverse turret
- Operate manual elevation pump
- Check main gun firing circuit

TM 9-2350-257-20-2-3 for procedures to:
- Bleed turret hydraulic system
- Install manual elevation accumulator

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Gunner's Control Box	FO-1	2
Turret Traverse Lock	FO-4	6
Power Pack	FO-1	18

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Gunner's control box ELEV/TRAV POWER switch set to OFF

GENERAL INSTRUCTIONS:

NOTE

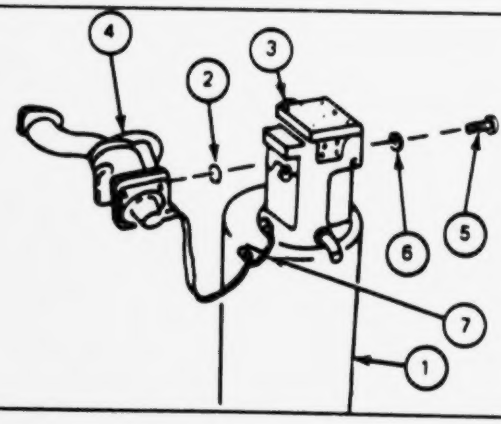
Soldier A will be inside turret in gunner's area.

Soldier B will be in driver's compartment.

13-55. MANUAL ELEVATION PUMP INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
	NOTE Soldier A does steps 1 through 6.
1.	Manually traverse turret until power pack (1) can be reached from driver's compartment (TM-10).
2.	Set turret traverse lock to LOCKED (TM-10).
3.	Coat three packings (2) with hydraulic fluid.
4.	Remove three plugs from ports of hydraulic riser (3).
5.	Put three packings (2) in three ports of hydraulic riser (3).
6.	Hold manual elevation pump (4) in place on hydraulic riser (3) during step 7.
7.	Soldier B: Using Allen wrench, attach manual elevation pump (4) to hydraulic riser (3) with six screws (5) and six lockwashers (6).
8.	Soldier A: Connect two electrical connectors (7) (JPG).
	NOTE Follow-on Maintenance Action Required: Install manual elevation accumulator (TM-20-2-3). Charge manual elevation accumulator (TM-20-2-3). Bleed turret hydraulic system (TM-20-2-3). Operate manual elevation pump and check main gun firing circuit to make sure they work properly (TM-10).
	END OF TASK



13-56. MANUAL ELEVATION PUMP DISASSEMBLY PROCEDURE

PERSONNEL: Two

PRELIMINARY PROCEDURES: **Remove manual elevation pump** (para 13-54)
Test manual elevation pump (para 13-53)

FRAME 1

Step	Procedure
1.	Remove handle (para 13-59).
2.	Remove switch housing (para 13-63).
3.	Disassemble handle (para 13-61).
4.	Disassemble switch housing (para 13-65).
5.	Disassemble axial pistons pump (para 13-68).
	END OF TASK

13-57. MANUAL ELEVATION PUMP ASSEMBLY PROCEDURE

PERSONNEL: One

FRAME 1

Step	Procedure
1.	Assemble handle (para 13-62).
2.	Assemble switch housing (para 13-66).
3.	Assemble axial pistons pump (para 13-69).
4.	Install handle (para 13-60).
5.	Install switch housing (para 13-64).
	NOTE Follow-on Maintenance Action Required: Test manual elevation pump (para 13-53).
	END OF TASK

13-58. HANDLE INSPECTION PROCEDURE

PERSONNEL: One

REFERENCES: JPG for procedure to inspect and repair parts

PRELIMINARY PROCEDURES:
Remove manual elevation pump (para 13-54)
Test manual elevation pump (para 13-53)
Remove handle (para 13-59)
Disassemble handle (para 13-61)

GENERAL INSTRUCTIONS:

NOTE

If any part is bad, order repair part or next higher assembly, as required.

13-58. HANDLE INSPECTION PROCEDURE (CONT)

FRAME 1

Step | **Procedure**

SUPPORT SHOP WORK

1. Take handle parts to shop where inspection equipment is available.
2. Make dimensional check.

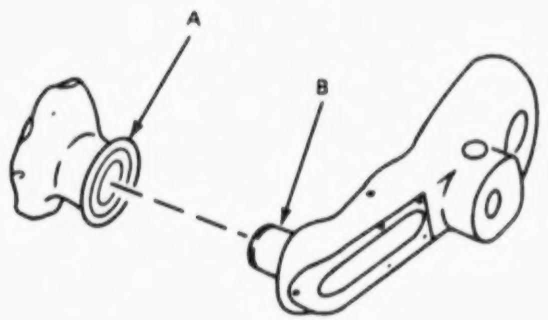
Reference Number	Point of Measurement	Measurement (Inches)
A	Inside diameter of support bushings	0.822 max
B	Outside diameter of arm handle shaft	0.809 min

NOTE

Tag parts that are out of tolerance.

3. After support shop work, return handle parts to turret shop.

END OF TASK



13-59. HANDLE REMOVAL PROCEDURE

TOOLS: 7/32" socket head screw key (Allen wrench)

PERSONNEL: One

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Gunner's Control Box	FO-1	2
Turret Traverse Lock	FO-4	6
Manual Elevating Handle	FO-1	21

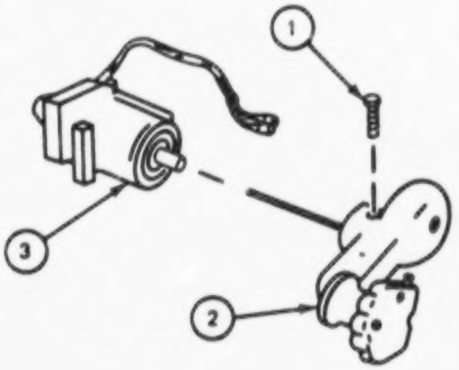
NOTE

Equipment condition applies only if manual elevation pump is installed in vehicle.

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Gunner's control box ELEV/TRAV POWER switch set to OFF
Turret traverse lock set to LOCKED

FRAME 1

Step	Procedure
1.	Using Allen wrench, remove screw (1) from handle (2).
2.	Remove handle (2) from axial pistons pump (3).
	END OF TASK



13-60. HANDLE INSTALLATION PROCEDURE

TOOLS: 7/32" socket head screw key (Allen wrench)

PERSONNEL: One

REFERENCES: TM 9-2350-257-10 for procedures to check main gun firing circuit

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Gunner's Control Box	FO-1	2
Turret Traverse Lock	FO-4	6
Manual Elevating Handle	FO-1	21

NOTE

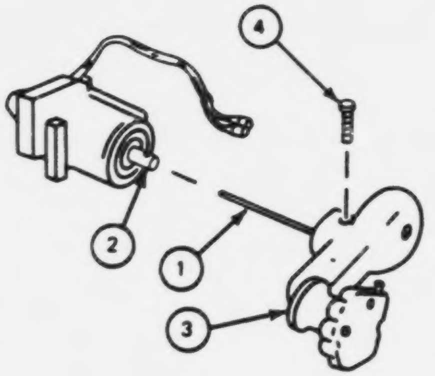
Equipment condition applies only if manual elevation pump is installed in vehicle.

EQUIPMENT CONDITION. Driver's master control panel MASTER BATTERY switch set to OFF
Turret traverse lock set to LOCKED

13-60. HANDLE INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Put actuating pin (1) in center of axial pistons pump shaft (2).
2.	Line up slot on shaft (2) with screw hole of handle (3).
3.	Using Allen wrench, attach handle (3) to shaft (2) with screw (4).
	NOTE Follow-on Maintenance Action Required: Test manual elevation pump (para 13-53) (if manual elevation pump is not installed in vehicle). Check main gun firing circuit (TM-10) (if manual elevation pump is installed in vehicle).
	END OF TASK



13-61. HANDLE DISASSEMBLY PROCEDURE

TOOLS: 5/32" drive pin punch
8 ounce ball peen hammer
1/4" flat tip screwdriver
External retaining ring pliers
7/64" socket head screw key (Allen wrench)
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

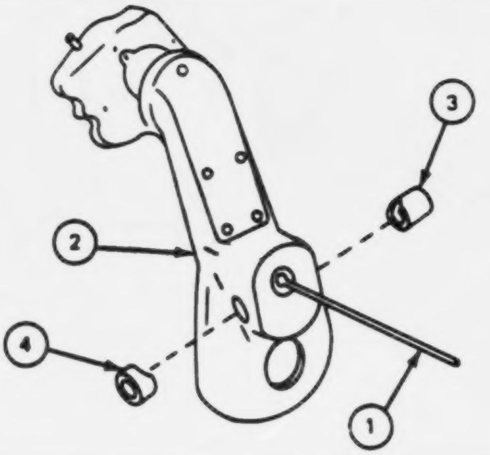
PERSONNEL: One

REFERENCES: JPG for procedures to:
Clean parts
Inspect and repair parts
Use retaining ring pliers

PRELIMINARY PROCEDURES: Remove handle (para 13-59)

FRAME 1

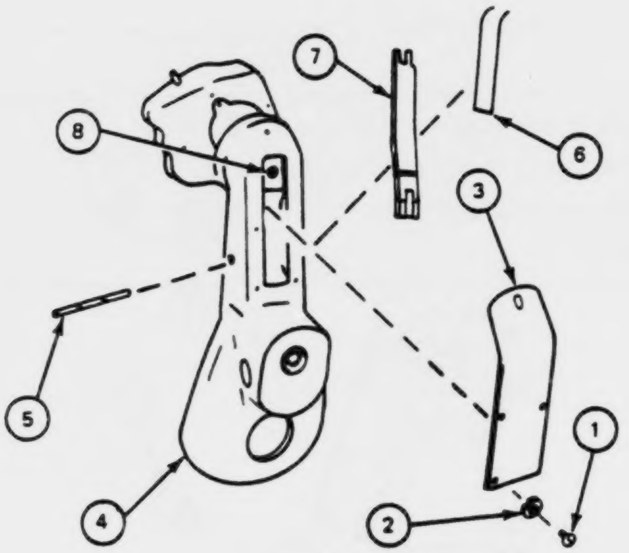
Step	Procedure
1.	Using hands, remove actuating pin (1) from handle (2).
2.	Using punch, push sleeve clamp (3) from handle (2).
3.	Using punch, push bushing clamp (4) from handle (3).
	GO TO FRAME 2



13-61. HANDLE DISASSEMBLY PROCEDURE (CONT)

FRAME 2

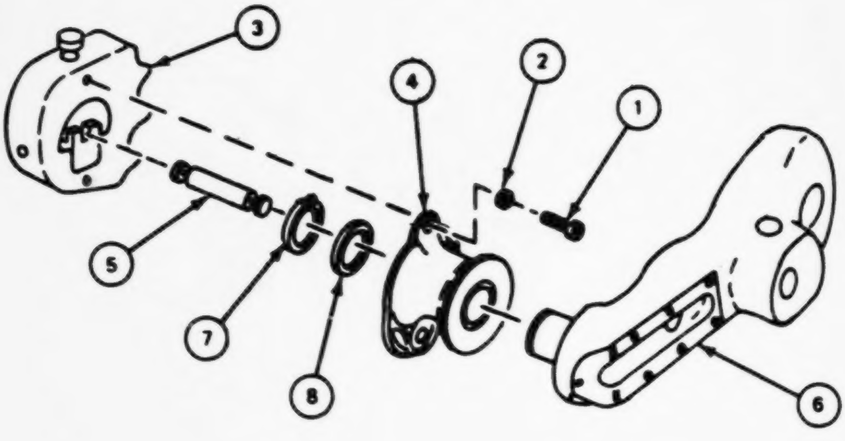
Step	Procedure
1.	Using screwdriver, remove five screws (1) and five lockwashers (2) that attach cover (3) to arm (4).
2.	Remove cover (3) from arm (4).
3.	Using hammer and pin punch, drive out pivot pin (5).
4.	Remove tension spring (6) from arm (4).
5.	Using screwdriver, remove upper end of operating arm (7) from rod (8).
6.	Remove operating arm (7) from arm (4).
	GO TO FRAME 3



13-61. HANDLE DISASSEMBLY PROCEDURE (CONT)

FRAME 3

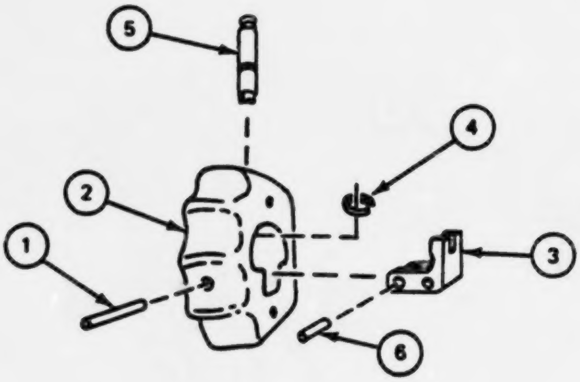
Step	Procedure
1.	Using Allen wrench, remove two screws (1) and two lockwashers (2) that attach handle (3) to support (4).
2.	Pull handle (3) and rod (5) from arm (6).
3.	Separate rod (5) from handle (3).
4.	Using pliers, remove retaining ring (7) from shaft of arm (6) (JPG).
5.	Remove washer (8) and support (4) from shaft of arm (6).
	GO TO FRAME 4



13-61. HANDLE DISASSEMBLY PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Using hammer and pin punch, drive out pivot pin (1) from handle (2).
2.	Remove yoke (3) from handle (2).
3.	Using pliers, remove retaining ring (4) from end of pushbutton (5) (JPG).
4.	Remove pushbutton (5) from handle (2).
5.	Using hammer and punch, remove pin (6) from yoke (3). GO TO FRAME 5



13-61. HANDLE DISASSEMBLY PROCEDURE (CONT)

FRAME 5

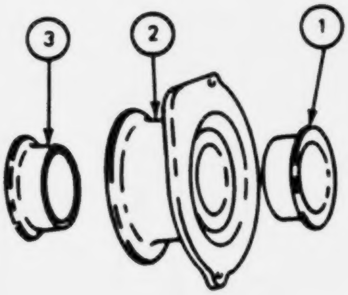
Step	Procedure
1.	Using punch, push bushing (1) from support (2).
2.	Using punch, push bushing (3) from support (2).

NOTE

Follow-on Maintenance Action Required:

Clean all parts (JPG).
Inspect and repair all parts (JPG).
Do detail inspection of handle (para 13-58).

END OF TASK



13-62. HANDLE ASSEMBLY PROCEDURE

TOOLS: 5/32" drive pin punch
8 ounce ball peen hammer
1/4" flat tip screwdriver (two)
External retaining ring pliers
7/64" socket head screw key (Allen wrench)
Plastic faced hammer

SUPPLIES: Grease (item 13, App. A)

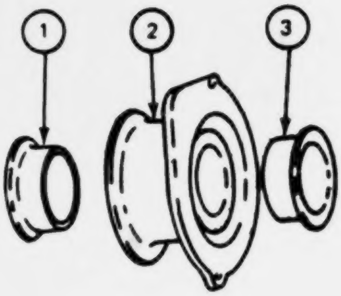
PERSONNEL: Two

REFERENCES: JPG for procedures to:
Use retaining ring pliers
Apply grease

PRELIMINARY PROCEDURES: Inspect handle parts (para 13-58)

FRAME 1

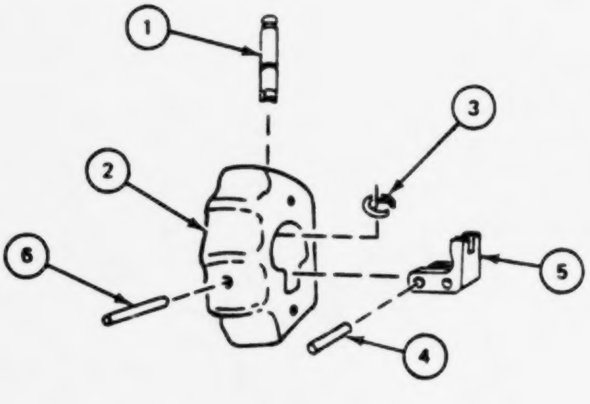
Step	Procedure
1.	Using fingers, push bushing (1) in support (2).
2.	Using fingers, push bushing (3) in support (2).
3.	Using plastic faced hammer, seat bushings (1) and (3) in support (2) by tapping lightly. GO TO FRAME 2



13-62. HANDLE ASSEMBLY PROCEDURE (CONT)

FRAME 2

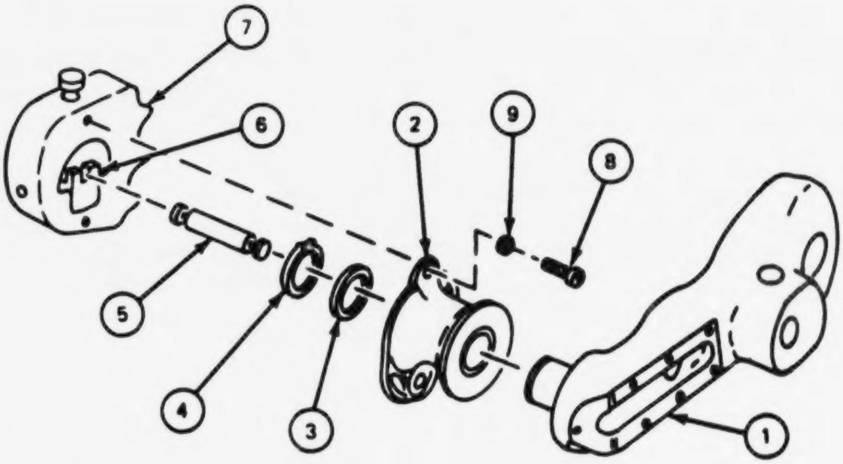
Step	Procedure
1.	Put pushbutton (1) through hole in handle (2).
2.	Using pliers, put retaining ring (3) on pushbutton (1).
3.	Using ball peen hammer, tap pin (4) in yoke (5).
4.	Put yoke (5) in handle (2). Check that pushbutton (1) is engaged with yoke.
5.	Using ball peen hammer and punch, put pivot pin (6) into handle (2) and yoke (5). GO TO FRAME 3



13-62. HANDLE ASSEMBLY PROCEDURE (CONT)

FRAME 3

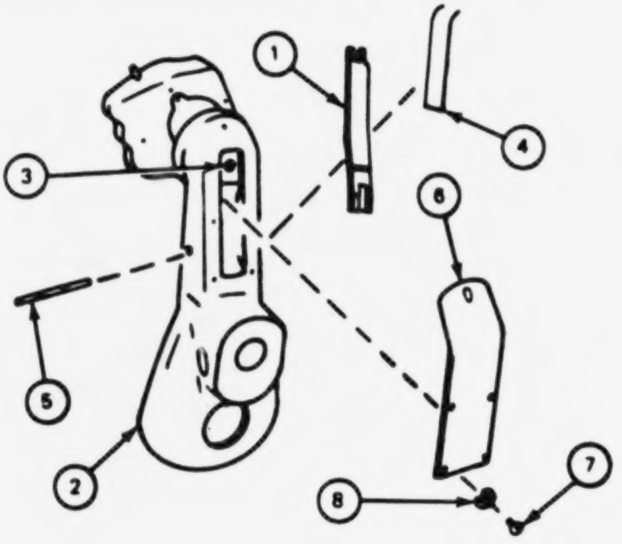
Step	Procedure
1.	Coat bearing surface of arm (1) with grease (JPG).
2.	Put support (2) and washer (3) on shaft of arm (1).
3.	Using pliers, put retaining ring (4) on shaft of arm (1) (JPG).
4.	Push rod (5) part way into shaft of arm (1).
5.	Engage end of rod (5) with yoke (6) in handle (7). Push handle up against support (2).
6.	Using Allen wrench, attach handle (7) to support (2) with two screws (8) and two lockwashers (9).
	GO TO FRAME 4



13-62. HANDLE ASSEMBLY PROCEDURE (CONT)

FRAME 4

Step	Procedure
	NOTE Soldier A does all steps except step 4.
1.	Put operating arm (1) in slot on back of arm (2).
2.	Using hand, engage upper end of operating arm (1) with rod (3).
3.	Put tension spring (4) in slot on operating arm (1) with bent ends of tension spring pointing out.
4.	Soldier B: Using two screwdrivers, hold both legs of tension spring (4) down so pivot pin (5) will go over them during step 5.
5.	Using ball peen hammer and punch, drive pivot pin (5) into arm (2) and operating arm (1).
6.	Put cover (6) on back of arm (2).
7.	Using screwdriver, attach cover (6) to arm (2) with five screws (7) and five lockwashers (8).
	GO TO FRAME 5



13-62. HANDLE ASSEMBLY PROCEDURE (CONT)

FRAME 5

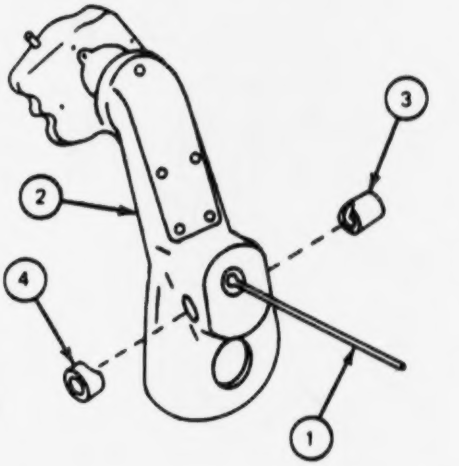
Step	Procedure
1.	Using hands, put headed end of actuating pin (1) in shaft hole of handle (2).
2.	Hook headed end of actuating pin (1) in slot on lower end of operating arm (inside shaft hole of handle).
3.	Using hand, push sleeve clamp (3) into handle (2) with cut out part toward actuating pin (1).
4.	Using hand, push bushing clamp (4) into handle (2) with cut out part toward actuating pin (1).

NOTE

Follow-on Maintenance Action Required:

Install handle (para 13-60).

END OF TASK



13-63. SWITCH HOUSING REMOVAL PROCEDURE

TOOLS: 1/4" flat tip screwdriver

PERSONNEL: One

REFERENCES: JPG for procedure to disconnect electrical connectors

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Gunner's Control Box	FO-1	2
Turret Traverse Lock	FO-4	6
Manual Elevating Handle	FO-1	21

NOTE

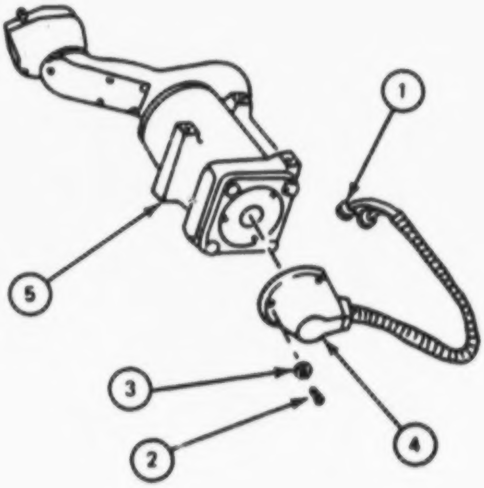
Equipment condition applies only if manual elevation pump is installed in vehicle.

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Gunner's control box ELEV/TRAV POWER switch set to OFF
Turret traverse lock set to LOCKED

13-63. SWITCH HOUSING REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
	NOTE Go to step 2 if manual elevation pump has been removed.
1.	Disconnect two electrical connectors (1) (JPG).
2.	Using screwdriver, remove three screws (2) and three lockwashers (3) that attach switch housing (4) to axial pistons pump (5).
3.	Remove switch housing (4). END OF TASK



13-64. SWITCH HOUSING INSTALLATION PROCEDURE

TOOLS: 1/4" flat tip screwdriver

PERSONNEL: One

REFERENCES: JPG for procedure to connect electrical connectors
TM 9-2350-257-10 for procedures to check main gun firing circuit

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Gunner's Control Box	FO-1	2
Turret Traverse Lock	FO-4	6
Manual Elevating Handle	FO-1	21

NOTE

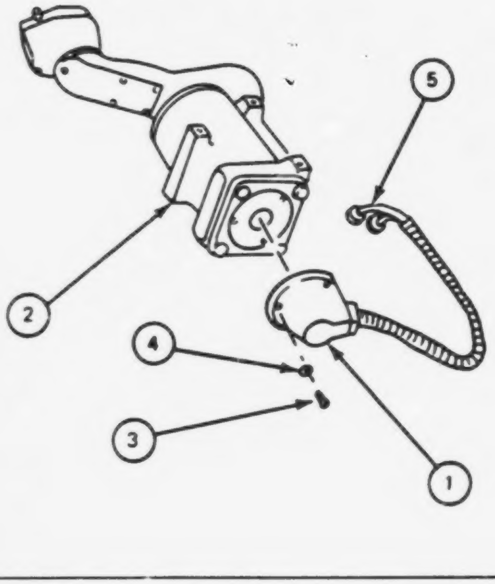
Equipment condition applies only if manual elevation pump is installed in vehicle.

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Turret traverse lock set to LOCKED
Gunner's control box ELEV/TRAV POWER switch set to OFF

13-64. SWITCH HOUSING INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Put switch housing (1) against pump (2).
2.	Using screwdriver, attach switch housing (1) to pump (2) with three screws (3) and three lockwashers (4).
	NOTE Do step 3 only if manual elevation pump is installed in vehicle.
3.	Connect two electrical connectors (5) (JPG).
	NOTE Follow-on Maintenance Action Required: Test manual elevation pump (para 13-53 (if manual elevation pump is not installed in vehicle). Check main gun firing circuit (TM-10) (if manual elevation pump is installed in vehicle).
	END OF TASK



13-65. SWITCH HOUSING DISASSEMBLY PROCEDURE

TOOLS: 7/8" open end wrench
No. 1 cross tip screwdriver (Phillips)
Soldering iron
Vise with brass caps
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

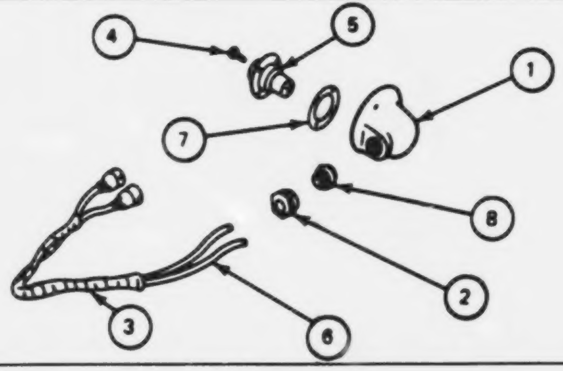
REFERENCES: JPG for procedures to:
Clean parts
Inspect and repair parts
Use soldering iron

PRELIMINARY PROCEDURES: Remove switch housing (para 13-63)

13-65. SWITCH HOUSING DISASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
	CAUTION Do not overtighten vise or switch housing will be damaged.
1.	Put switch housing (1) in vise.
2.	Using wrench, remove nut (2) from switch housing (1) and pull nut back from switch housing on cable (3).
3.	Using screwdriver, remove four screws (4) that attach switch (5) to switch housing (1).
4.	Using fingers, pull switch (5) with cable (3) out of housing (1) until two cable leads (6) can be reached.
5.	Using soldering iron, unsolder two cable leads (6) from switch (5) (JPG). Remove switch.
6.	Remove gasket (7) from switch (5).
7.	Remove cable (3) and grommet (8) from housing (1).
8.	Remove nut (2) from cable (3).
9.	Remove switch housing (1) from vise.
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK



13-66. SWITCH HOUSING ASSEMBLY PROCEDURE

TOOLS: 7/8" open end wrench
No. 1 cross tip screwdriver (Phillips)
Soldering iron

SUPPLIES: Solder (item 31, App. A)
Silicone compound (item 9, App. A)

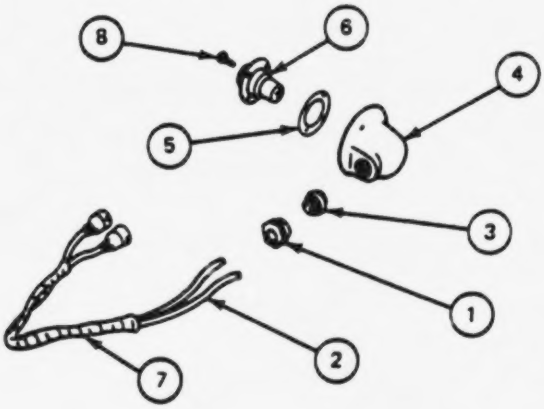
PERSONNEL: One

REFERENCES: JPG for procedures to:
Use soldering iron
Apply silicone

13-66. SWITCH HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Slide nut (1), with hex end first, on cable leads (2).
2.	Put light coat of silicone compound on cable leads (2) and outer edge of grommet (3).
3.	Slide grommet (3) on cable leads (2).
4.	Slide cable leads (2) through housing (4) far enough that soldering can be done.
5.	Install grommet (3) in housing (4).
6.	Start threads of nut (1) in housing (4). Do not tighten nut.
7.	Put gasket (5) over switch (6). Line up screw holes.
8.	Using soldering iron, solder two cable leads (2) to switch (6) (JPG).
9.	Gently pull cable (7) and push switch (6) until switch (6) is against housing (4).
10.	Using screwdriver, attach switch (6) to housing (4) with four screws (8).
11.	Using wrench, tighten nut (1).
	END OF TASK



13-67. AXIAL PISTONS PUMP INSPECTION PROCEDURE

PERSONNEL: One

REFERENCES: JPG for procedures to inspect and repair parts

PRELIMINARY PROCEDURES:
Remove manual elevation pump (para 13-54)
Test manual elevation pump (para 13-53)
Remove handle (para 13-59)
Remove switch housing (para 13-63)
Disassemble axial pistons pump (para 13-68)

GENERAL INSTRUCTIONS:

NOTE

If any part is bad, order repair part or next higher assembly, as required.

13-67. AXIAL PISTONS PUMP INSPECTION PROCEDURE (CONT)

FRAME 1

Step	Procedure
	SUPPORT SHOP WORK
1.	Take axial piston pump parts to shop where inspection equipment is available.
2.	Make dimensional check

Reference Letter	Point of Measurement	Measurement (Inches)
A	ID of bearing retainer	1.3790 max
B	OD of shaft spacer	1.3750 min
C	ID of shaft spacer	0.6290 max
D	OD of shaft spacer shoulder	0.6230 min
E	OD of bearing	1.3775 min
F	OD of bearing	1.5743 min
G	OD of bearing	0.8745 min
H	OD of handle shaft spacer shoulder	0.3100 min
J	ID of shaft slide	1.5753 max
K	OD of spacer	0.8700 min
L	ID of spacer	0.3160 max
M	ID of block center bore	0.8753 max
N	Fit of piston in block piston bore (piston and bore are matched sets)	0.0050 max

NOTE

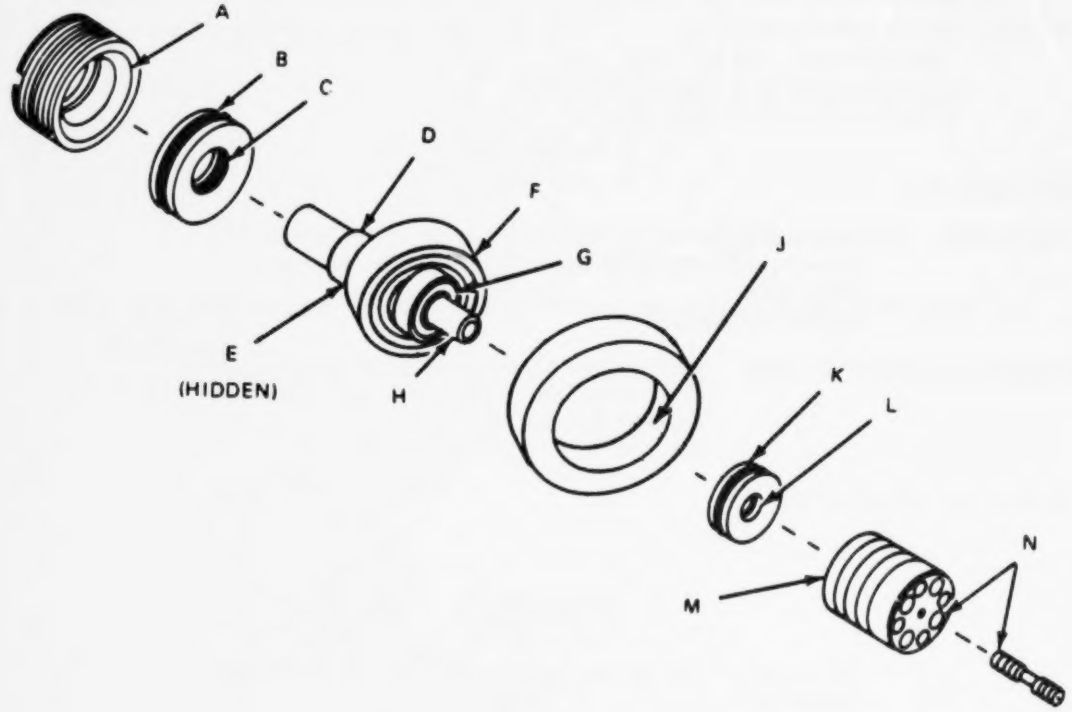
Tag parts that are out of tolerance.

Step	Procedure
3.	After support shop work, return parts to turret shop.

NOTE

If bearing measurements are out of tolerance, replace bearing (para 13-70).

END OF TASK


A
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(HIDDEN)
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J
K
L
N
M

13-68. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE

TOOLS: Adjustable hook, fixed pivot point spanner wrench
Open face spanner wrench (7010376)
7/16" open end wrench
11/16" open end wrench
8 ounce ball peen hammer
Plastic faced hammer
Vise with brass caps
Metal scribe
O-ring extractor kit
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Pencil with attached eraser
Wood dowel, 1" dia x 6" long
Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Remove preformed packings
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove manual elevation pump (para 13-54)
Test manual elevation pump (para 13-53)
Remove handle (para 13-59)
Remove switch housing (para 13-63)

GENERAL INSTRUCTIONS:

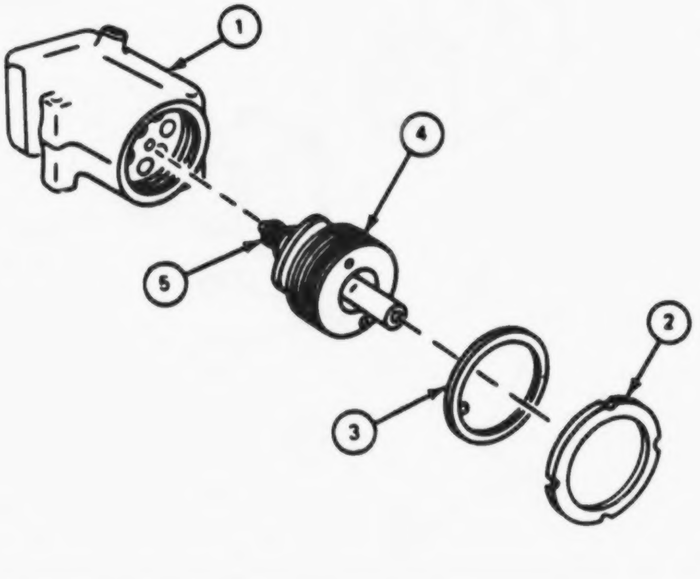
CAUTION

Keep dirt from getting in parts. Dirt can damage equipment.

13-68. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 1

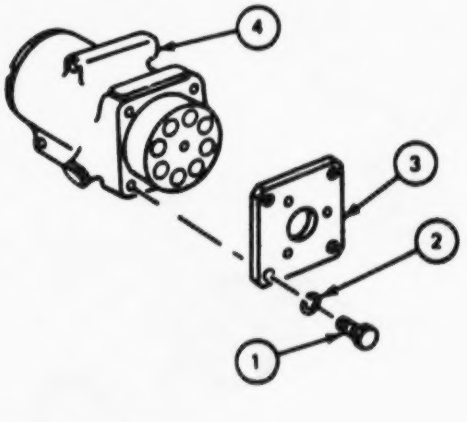
Step	Procedure
	CAUTION Do not overtighten vise or pump will be damaged.
1.	Put pump (1) in vise.
2.	Using adjustable hook spanner wrench, remove locknut (2) from pump housing (1).
3.	Remove washer (3) from pump housing (1).
	WARNING Be careful when removing retainer (4) from pump (1). Spring-loaded parts may fly out of pump and hit you.
4.	Using open face spanner wrench, remove retainer (4) with shaft (5) from pump (1). GO TO FRAME 2



13-68. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 2

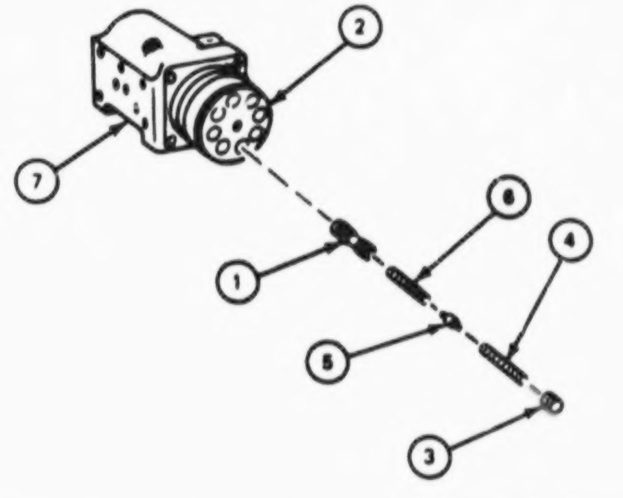
Step	Procedure
	WARNING Stuck pistons in block may cause spring-loaded parts to fly out and hit you.
1.	Using 7/16" wrench, remove four screws (1) and four lockwashers (2) that attach plate (3) to pump housing (4).
2.	Remove plate (3) from pump housing (4). GO TO FRAME 3



13-68. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 3

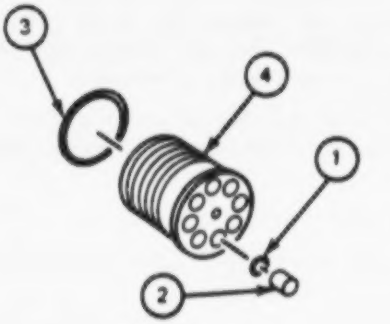
Step	Procedure
	NOTE Retainers (3) are held in by packings. Hold each retainer to keep spring-loaded parts from flying out while pushing on piston (1).
1.	Using eraser end of pencil, push on piston (1) at back of block (2).
2.	Remove retainer (3), spring (4), guide (5), spring (6) and piston (1).
	NOTE Pistons (1) are matched to holes in block (2) and must not get mixed up. Pistons and their holes in block should be numbered from one through eight. If they are not, do step 3 as each piston is removed.
3.	Using metal scribe, lightly scribe number on piston (1) (in narrow part of piston shank) and hole in block (2). Number clockwise around block, looking at piston end of block for seven other pistons.
4	Repeat steps 1 and 2 for seven more pistons (1)
5.	Using ball peen hammer and wood dowel, lightly tap block (2) from pump housing (7).
	GO TO FRAME 4



13-68. AXIAL PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 4

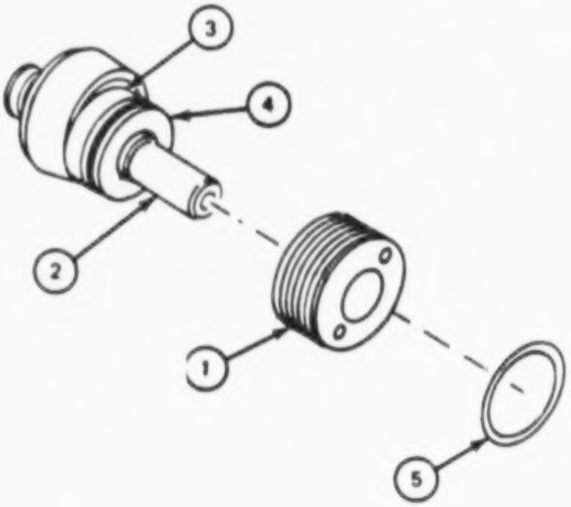
Step	Procedure
1.	Using O-ring extractor tool, remove eight packings (1) from eight retainers (2) (JPG).
2.	Using O-ring extractor tool, remove four packings (3) from block (4) (JPG). GO TO FRAME 5



13-68 AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 5

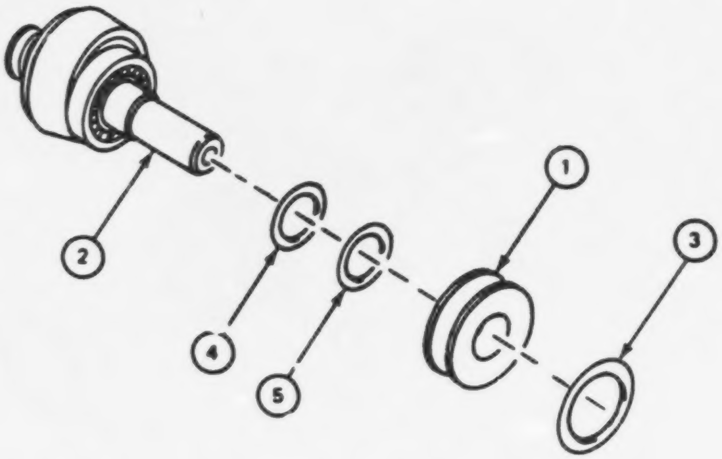
Step	Procedure
1	Using plastic faced hammer and holding retainer (1) in hand, lightly tap shaft (2) to remove retainer (1) from bearing (3) and spacer (4).
2.	Using O-ring extractor tool, remove packing (5) from retainer (1) (JPG). GO TO FRAME 6



13-68. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 6

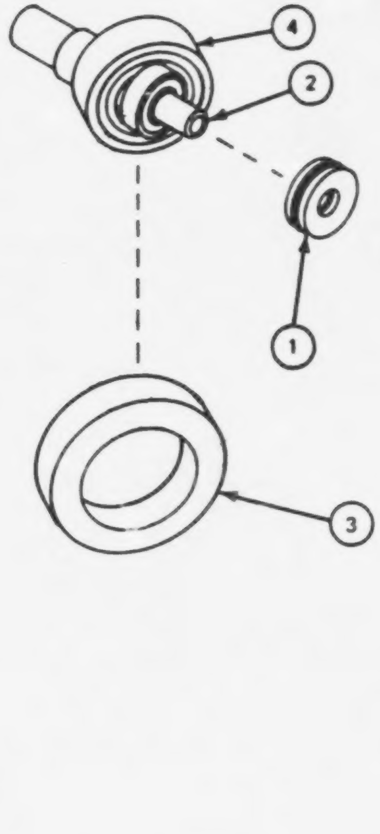
Step	Procedure
1.	Using fingers, remove spacer (1) from shaft (2).
2.	Using O-ring extractor tool, remove packing (3) from outside of spacer (1) (JPG).
3.	Using O-ring extractor tool, remove packing (4) from inside of spacer (1) (JPG).
4.	Using O-ring extractor tool, remove retainer (5) from inside of spacer (1) (JPG).
	GO TO FRAME 7



13-68. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 7

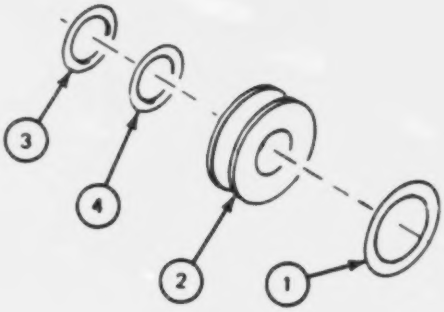
Step	Procedure
1.	Using fingers, remove spacer (1) from shaft (2).
2.	Using fingers, remove slide (3) from bearing (4).
	GO TO FRAME 8



13-68. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 8

Step	Procedure
1.	Using O-ring extractor tool, remove packing (1) from outside of spacer (2) (JPG).
2.	Using O-ring extractor tool, remove packing (3) from inside of spacer (2) (JPG).
3.	Using O-ring extractor tool, remove retainer (4) from inside of spacer (2).
	GO TO FRAME 9



13-68. AXIAL PISTONS PUMP DISASSEMBLY PROCEDURE (CONT)

FRAME 9

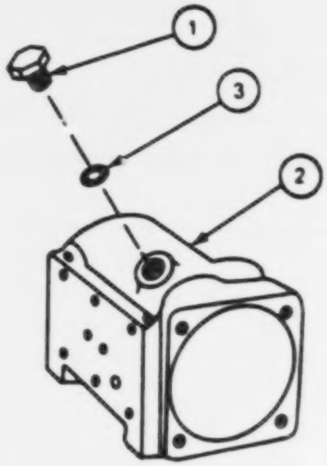
Step	Procedure
1.	Using 11/16" open end wrench, remove plug (1) from pump housing (2).
2.	Using O-ring extractor tool, remove packing (3) from plug (1) (JPG).

NOTE

Follow-on Maintenance Action Required:

Clean all parts (JPG).
Inspect and repair all parts (JPG).
Do detail inspection of axial pistons pump (para 13-67).

END OF TASK



13-69. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE

TOOLS: Adjustable hook, fixed pivot point spanner wrench
Open face spanner wrench (7010376)
7/16" open end wrench
11/16" open end wrench
1/8" flat tip screwdriver
Plastic faced hammer
Vise with brass caps
3/8" drive torque wrench (0 to 150 inch-pounds)
7/16" socket (3/8" drive)
6" machinist steel rule
O-ring extractor kit

SUPPLIES: Parts kit, 5704210
Hydraulic fluid (item 10, App. A)
Two jacking screws, MS 90727-7 or -8

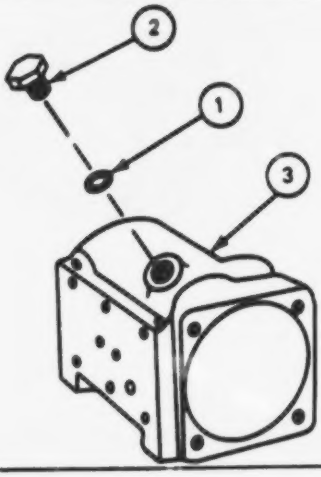
PERSONNEL: One

REFERENCES: JPG for procedures to:
Install preformed packings
Use torque wrench

PRELIMINARY PROCEDURES: Inspect axial pistons pump parts (para 13-67)

FRAME 1

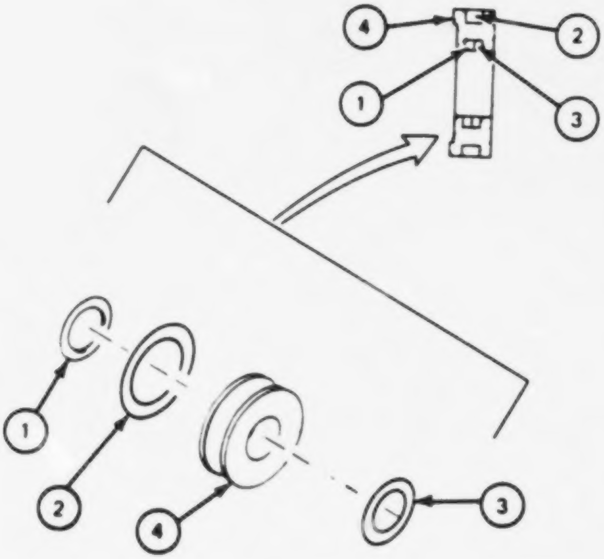
Step	Procedure
1.	Coat new packing (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put packing (1) on plug (2) (JPG).
3.	Using 11/16" wrench, put plug (2) in pump housing (3).
	GO TO FRAME 2



13-69. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 2

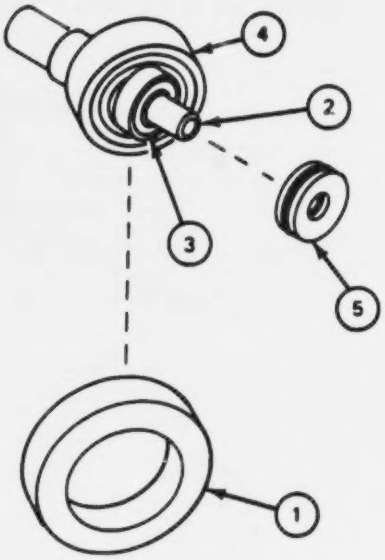
Step	Procedure
1.	Coat two new packings (1) and (2) and new retainer (3) with hydraulic fluid.
2.	Using O-ring extractor tool, put retainer (3) in spacer (4) (JPG).
	NOTE
	Retainer (3) is toward flat side of spacer (4).
3.	Using O-ring extractor tool, put packing (1) in spacer (4) (JPG).
4.	Using O-ring extractor tool, put packing (2) on spacer (4) (JPG).
	GO TO FRAME 3



13-69. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 3

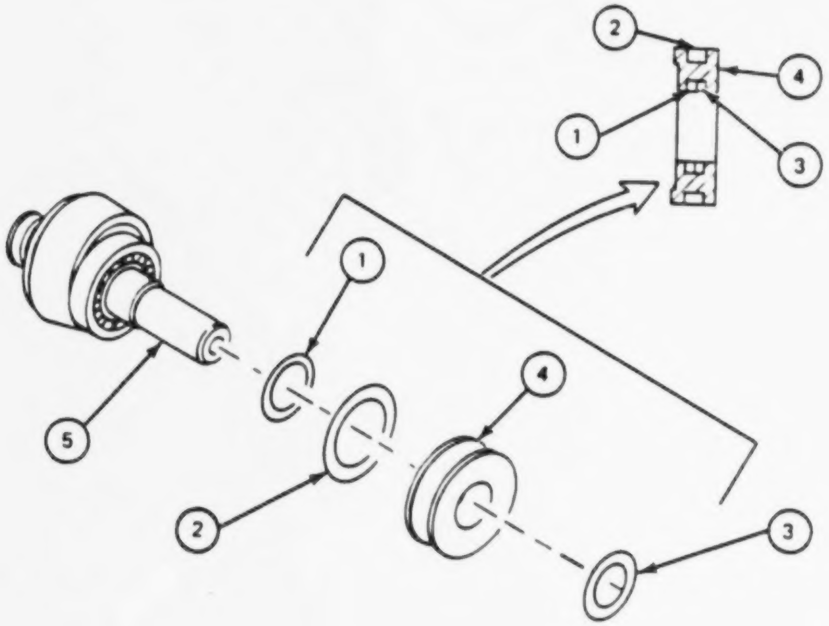
Step	Procedure
1.	Using hammer, tap slide (1) over small end of shaft (2) and small bearing (3) onto bearing (4).
2	Coat shaft (2) with hydraulic fluid.
3.	Using twisting motion, put spacer (5), with flat side out, on shaft (2).
	GO TO FRAME 4



13-69. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 4

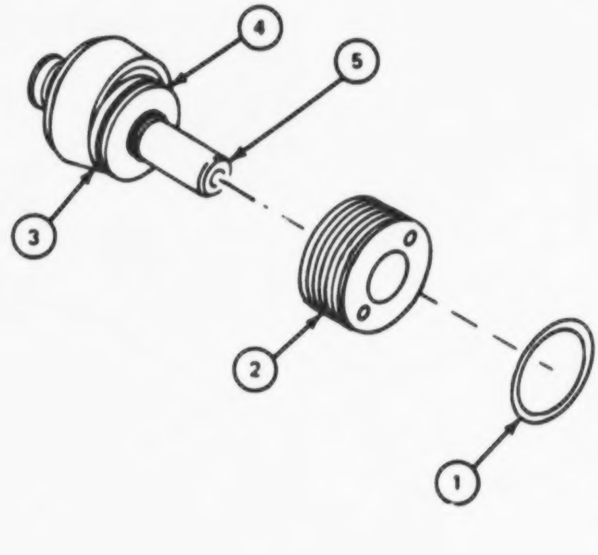
Step	Procedure
1.	Coat two new packings (1) and (2) and new retainer (3) with hydraulic fluid.
2.	Using O-ring extractor tool, put retainer (3) in spacer (4) (JPG). **NOTE** Retainer (3) is toward flat side of spacer (4).
3.	Using O-ring extractor tool, put packing (1) in spacer (4) (JPG).
4.	Using O-ring extractor tool, put packing (2) on spacer (4) (JPG).
5.	Coat shaft (5) with hydraulic fluid.
6.	Using twisting motion, put spacer (4) on shaft (5) with flat side out. GO TO FRAME 5



13-69. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 5

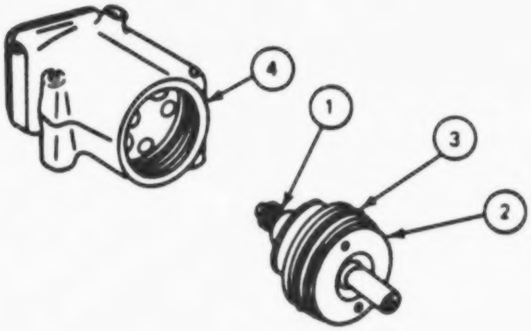
Step	Procedure
1.	Coat new packings (1) with hydraulic fluid.
2.	Put packing (1) on retainer (2) (JPG).
3.	Coat bearing (3), spacer (4), and inside of retainer (2) with hydraulic fluid.
4.	Using hammer, lightly tap retainer (2) over spacer (4) and bearing (3), onto shaft (5). GO TO FRAME 6



13-69. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 6

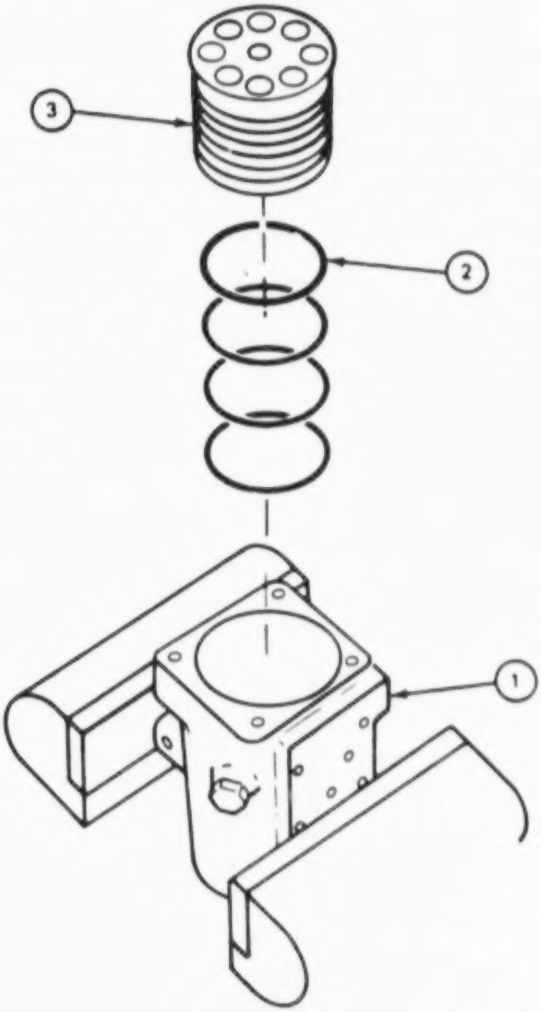
Step	Procedure
1.	Coat spacer (1), retainer (2) threads, and packing (3) with hydraulic fluid.
2.	Using open face spanner wrench, screw retainer (2) into pump housing (4) until packing (3) is just inside pump housing. GO TO FRAME 7



13-69. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 7

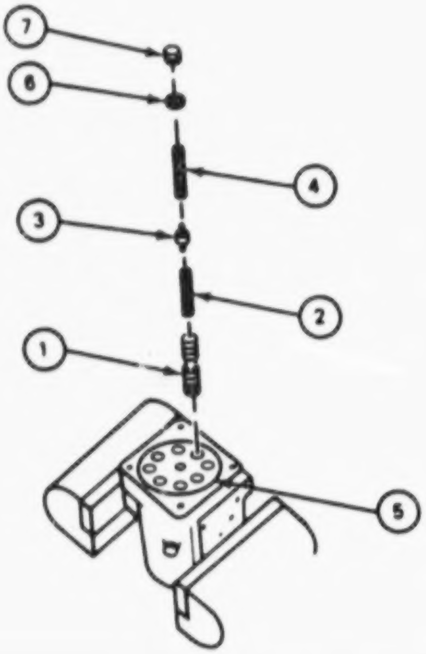
Step	Procedure
	CAUTION Do not overtighten vise, or pump will be damaged.
1.	Put pump (1) in vise with protected jaws.
2.	Coat four new packings (2) with hydraulic fluid.
3.	Put four packings (2) on block (3) (JPG).
4.	Coat lower inside area of block (3) with hydraulic fluid.
	CAUTION Take care not to damage packings (2).
5.	Using hammer, gently drive block (3) into pump housing (1) until top surface of block is even with face of pump housing.
	GO TO FRAME 8



13-69. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 8

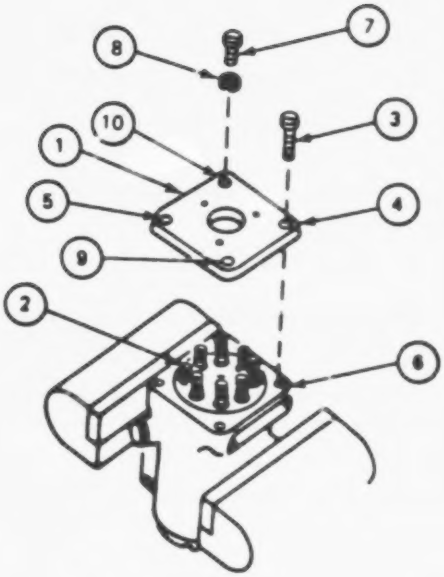
Step	Procedure
1.	Coat eight pistons (1), eight new springs (2), eight new guides (3), and eight new springs (4) with hydraulic fluid.
	NOTE Pistons (1) and holes in block (5) are matched sets. Pistons (in narrow part or piston shank) and holes are numbered. Each numbered piston must be put in the same numbered hole in block.
2.	Put eight pistons (1), eight springs (2), eight guides (3), and eight springs (4) in holes of block (5).
3.	Coat eight new packings (6) and eight retainers (7) with hydraulic fluid.
4.	Using O-ring extractor tool, put eight packings (6) on eight retainers (7) (JPG).
5.	Put eight retainers (7) on ends of eight springs (4).
	GO TO FRAME 9



13-69. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 9

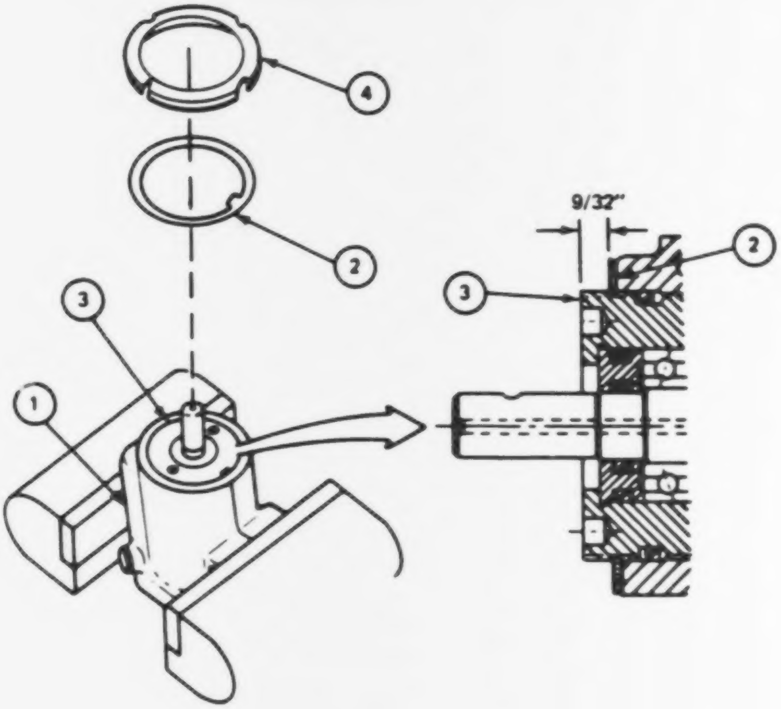
Step	Procedure
1.	Put plate (1) on eight retainers (2).
2.	Gently push down on plate (1) until two jacking screws (3) can be put through holes (4) and (5) of plate (1) into pump (6).
	CAUTION Take care that retainers are lined up with holes in block or they will be damaged.
3.	Using screwdriver, line up retainers (2) with holes in block. Take care not to scratch retainers, packings, or block.
	NOTE Take care not to bottom out jacking screws.
4.	Using 7/16" wrench, tighten jacking screws (3) enough so two screws (7) and two lockwashers (8) can be started through holes (9) and (10) of plate (1) into pump (6).
5.	Using 7/16" wrench, remove two jacking screws (3).
6.	Put two screws (7) and two lockwashers (8) through holes (4) and (5) of plate (1) into pump (6).
7.	Using 7/16" wrench, tighten four screws (7), one at a time, until tight, in the following order: holes (4), (5), (9), (10).
8.	Using torque wrench, torque four screws (7) to between 60 and 84 inch-pounds.
	GO TO FRAME 10



13-69. AXIAL PISTONS PUMP ASSEMBLY PROCEDURE (CONT)

FRAME 10

Step	Procedure
1.	Remove pump (1) from vise.
	CAUTION
	Do not overtighten vise, or pump will be damaged.
2.	Put pump (1) in vise with retainer end up.
3.	Put washer (2) over retainer (3), with tang of washer in slot of retainer.
	NOTE
	If distance obtained in step 4 is 9/32", omit step 5.
4.	Using steel rule, measure distance from washer (2) to end of retainer (3).
5.	Using open face spanner wrench, screw retainer (3) in or out until distance of 9/32" is obtained.
6.	Using adjustable hook spanner wrench, put on locknut (4).
	NOTE
	Follow-on Maintenance Action Required:
	Install handle (para 13-60) Install switch housing (para 13-64) Test manual elevation pump (para 13-53)
	END OF TASK


9/32"

13-70. AXIAL PISTONS PUMP REPAIR PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES:	Remove manual elevating pump (para 13-54) Test manual elevation pump (para 13-53) Remove handle (para 13-59) Remove switch housing (para 13-63) Disassemble axial pistons pump (para 13-68) Inspect axial pistons pump (para 13-67)

GENERAL INSTRUCTIONS:

NOTE

This procedure is used to replace bad shaft bearings. If bearings are bad, order repair part or next higher assembly as required.

13-70. AXIAL PISTONS PUMP REPAIR PROCEDURE (CONT)

FRAME 1

Step | **Procedure**

SUPPORT SHOP WORK

1. Take shaft and new bearings (1), (2), or (3) where bearing press and inspection equipment are available.

a. Remove bad bearing(s) from shaft.
b. Make dimensional check of parts:

Reference Letter	Point of Measurement	Measurement (Inches)
A	Outside diameter of bearing (1)	1.3775 min
B	Inside diameter of bearing (1)	0.6693 max
C	Outside diameter of shaft spacer shoulder	0.6230 min
D	Outside diameter of shaft bearing shoulder	0.6695 min
E	Outside diameter of shaft bearing shoulder	0.6692 min
F	Outside diameter of shaft bearing shoulder	0.3749 min
G	Outside diameter of shaft bearing shoulder	0.3100 min
H	Outside diameter of bearing (2)	1.5743 min
J	Inside diameter of bearing (2)	0.6693 max
K	Outside diameter of bearing (3)	0.8745 min
L	Inside diameter of beaing (3)	0.3750 max

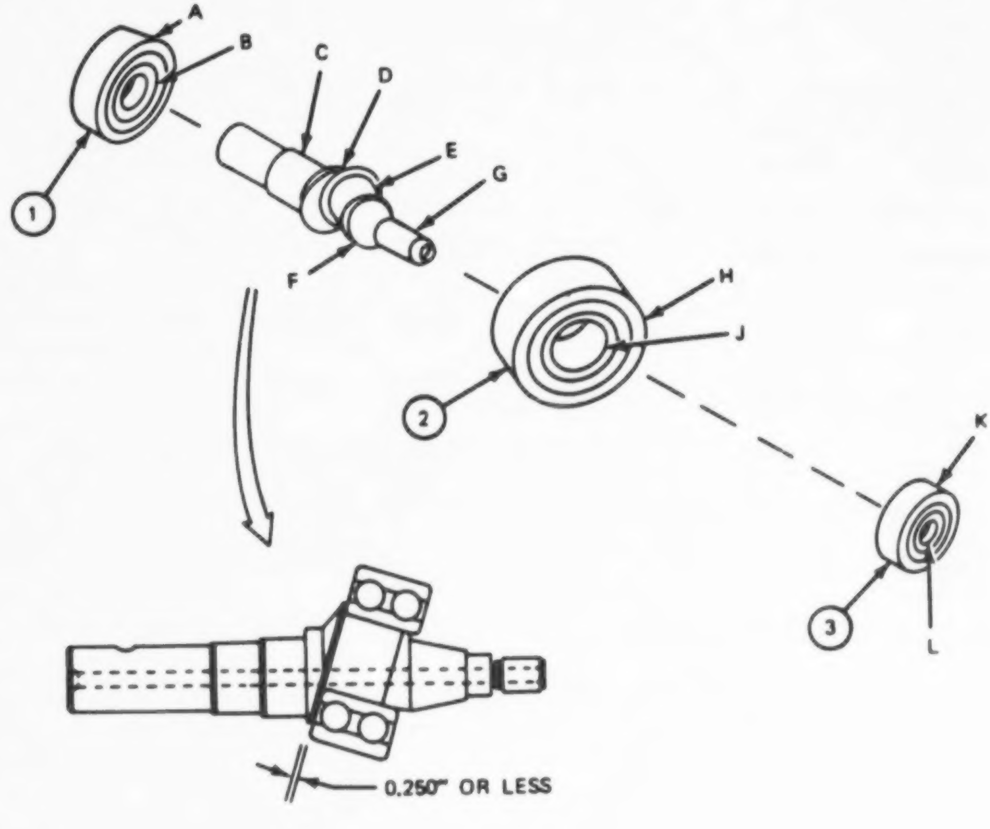
NOTE

Tag parts that are out of tolerance.

c. Install new bearing(s). When installing bearing (2), press bearing on shaft until bearing is no more than 0.250" from shaft shoulder.

2. After support shop work is complete, return repaired shaft to turret shop.

END OF TASK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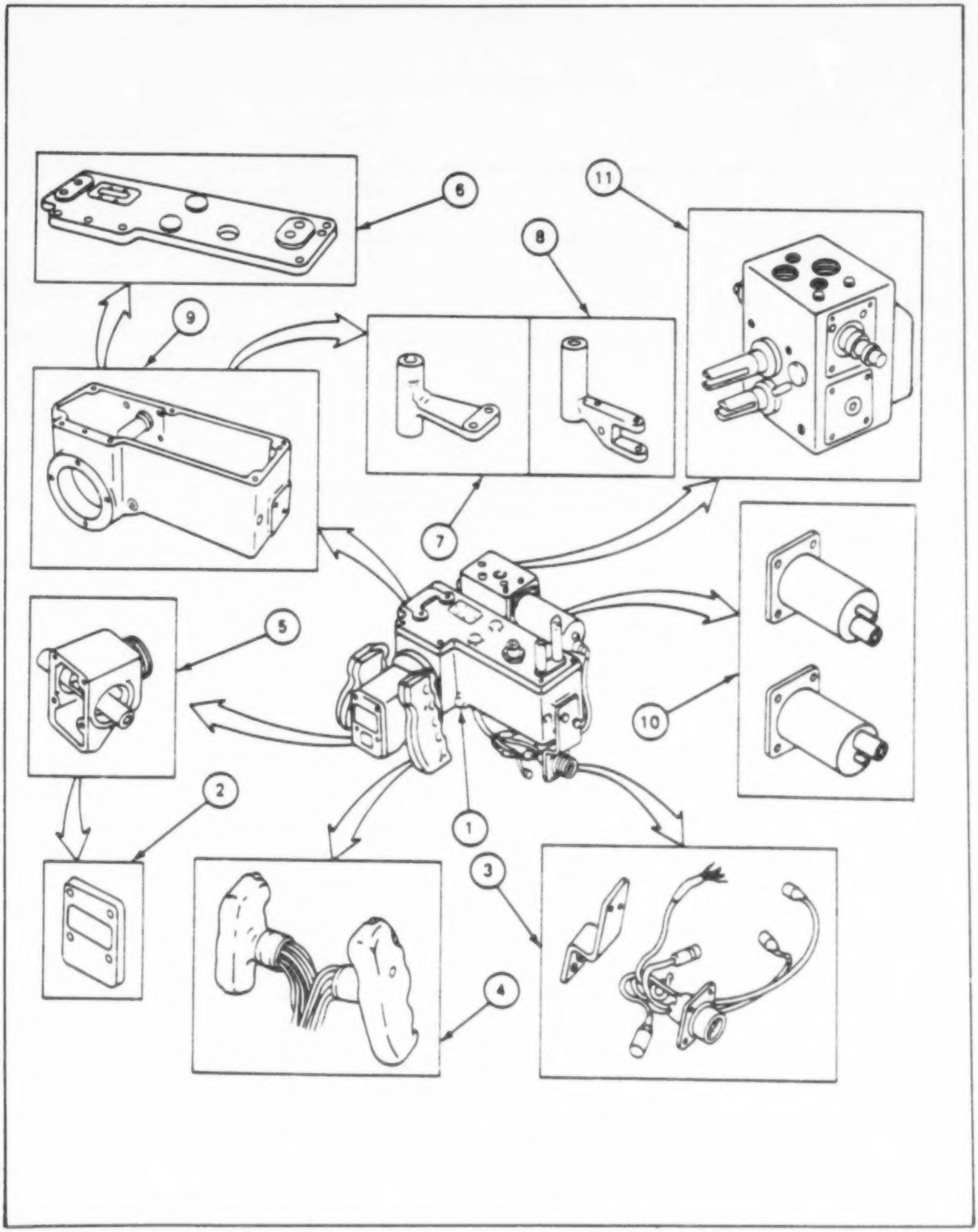
2
3
0.250" OR LESS

Section 13. GUNNER'S CONTROL

13-71. MAINTENANCE PROCEDURES INDEX

	TASKS							
Equipment Item	**Inspection**	**Test**	**Adjustment**	**Removal**	**Installation**	**Disassembly**	**Assembly**	**Repair**
1. Gunner's Control	. . .	13-72	13-73	. . .	. . .	13-74	13-75	. . .
2. Control Box Cover	. . .	. . .	. . .	13-76	13-77	. . .	. . .	. . .
3. Harness and Bracket	. . .	. . .	. . .	13-78	13-79	. . .	. . .	. . .
4. Handle	13-80	. . .	. . .	13-81	13-82	13-83	13-84	. . .
5. Control Box	13-85	. . .	. . .	13-86	13-87	13-86	13-87	. . .
6. Housing Cover	13-88	. . .	. . .	13-89	13-90	. . .	. . .	13-91
7. Traversing Arm	13-92	. . .	. . .	13-93	13-94	13-95	13-96	. . .
8. Elevating Arm	13-92	. . .	. . .	13-93	13-94	. . .	. . .	13-97
9. Housing	13-88	. . .	. . .	13-98	13-99	13-93	13-94	13-100
10. Power Solenoid and Override Solenoid	. . .	13-101	. . .	13-102	13-103	. . .	. . .	. . .
11. Hydraulic Valve	13-104	13-105		. . .	13-98	13-99	13-106	13-107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11
8
9
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5
10
2
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3
4

Para 13-71 Cont

13-72. GUNNER'S CONTROL TEST PROCEDURE

TEST EQUIPMENT: Multimeter
24-28 vdc power supply

PERSONNEL: One

REFERENCES: TM 9-2350-257-20-2-3 for procedure to remove gunner's control
JPG for procedures to:
- Use multimeter
- Disconnect and connect electrical connectors
- Use power supply

EQUIPMENT CONDITION: Gunner's control removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Assemble gunner's control (para 13-75)

GENERAL INSTRUCTIONS:

NOTE

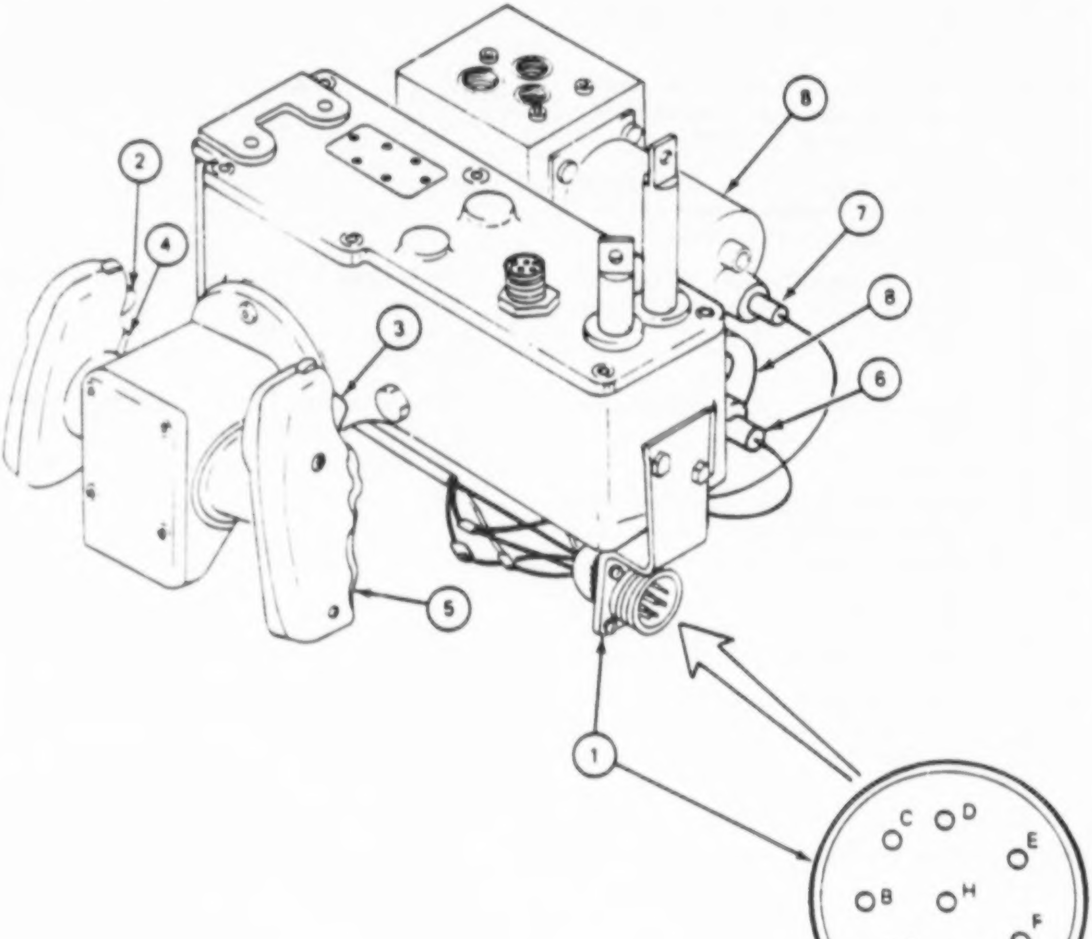
If normal indication is not obtained, remove probable fault items to find bad parts. Refer to section index (para 13-71) for replacement of bad parts.

13-72. GUNNER'S CONTROL TEST PROCEDURE (CONT)

a. Switches and Harness

FRAME 1

Step	Procedure	Normal Indication	Probable Fault
	NOTE Gun firing switches are normally open.		
1.	Using multimeter, check for continuity between pins A and B of electrical connector (1) (JPG).	Greater than 10 million ohms	Handle (trigger switches) or harness
2.	Repeat step 1 and press left trigger switch (2).	Less than 2 ohms	Handle (trigger switch)
3.	Repeat step 1 and press right trigger switch (3).	Less than 2 ohms	Handle (trigger switch)
	NOTE Brake switches are normally closed.		
4.	Using multimeter, check for continuity between pins C and D of electrical connector (1) (JPG).	Less than 2 ohms	Handle (brake switches) or harness
5.	Repeat step 4 and press left brake control switch (4).	Greater than 10 million ohms	Handle (brake switch)
6.	Repeat step 4 and press right brake control switch (5).	Greater than 10 million ohms	Handle (brake switch)
7.	Disconnect electrical connectors (6) and (7) from two solenoids (8) (JPG).	. . .	. . .
8.	Using multimeter, check for continuity between pin F and electrical connector 623 (6) (JPG).	Less than 2 ohms	Harness
9.	Using multimeter, check for continuity between pin C and electrical connector 625A (7) (JPG).	Less than 2 ohms	Harness
	GO TO FRAME 2		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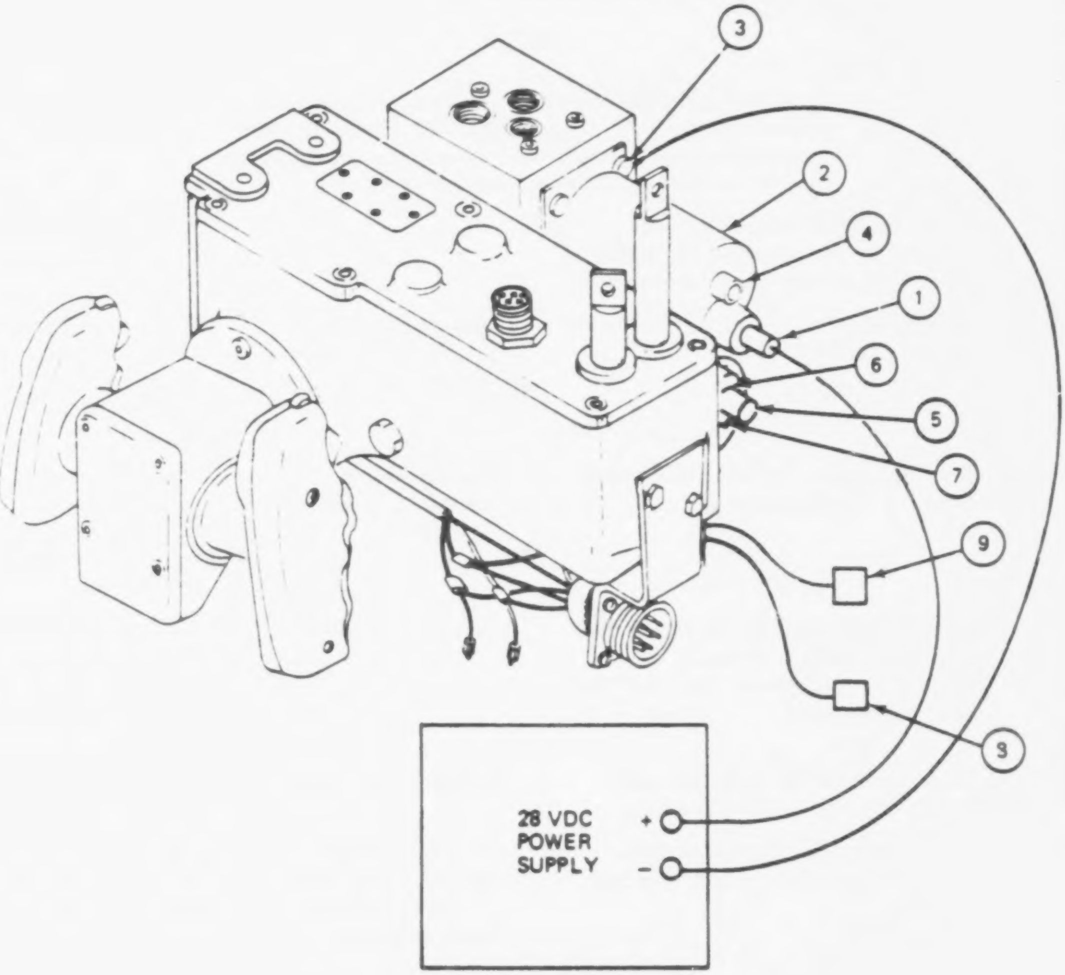
13-72. GUNNER'S CONTROL TEST PROCEDURE (CONT)

b. Power and Override Solenoids

FRAME 2

Step	Procedure	Normal Indication	Probable Fault
1.	Set up 24-28 vdc power supply (JPG).	. . .	. . .
2.	Connect positive lead from power supply to electrical connector (1) of power solenoid (2) (JPG).	. . .	. . .
3.	Connect negative lead from power supply to mounting screw (3) of power solenoid (2) (JPG).	. . .	. . .
4.	Turn on power supply (JPG) and push in power solenoid (2) plunger (4).	Power solenoid (2) plunger (4) can be pushed in with little effort and stays in.	Power solenoid
5.	Turn off power supply (JPG).	Power solenoid (2) plunger (4) moves outward.	Power solenoid
6.	Disconnect positive lead from power supply to electrical connector (1) of power solenoid (2) (JPG).	. . .	. . .
7.	Connect positive lead from power supply to electrical connector (5) of override solenoid (6) (JPG).	. . .	. . .
8.	Turn on power supply (JPG) and push in override solenoid (6) plunger (7).	Override solenoid (6) plunger (7) can be pushed in with little effort and stays in.	Override solenoid
9.	Turn off power supply (JPG).	Override solenoid (6) plunger (7) moves outward.	Override solenoid
10.	Disconnect positive and negative leads from screw (3) and override solenoid (6).	. . .	. . .
11.	Connect electrical connector 625A (8) to power solenoid electrical connector (1) and electrical connector 623 (9) to override solenoid electrical connector (5) (JPG). GO TO FRAME 3		


28 VDC
POWER
SUPPLY
+
−

13-72. GUNNER'S CONTROL TEST PROCEDURE (CONT)

c. Handle Movement

FRAME 3

NOTE

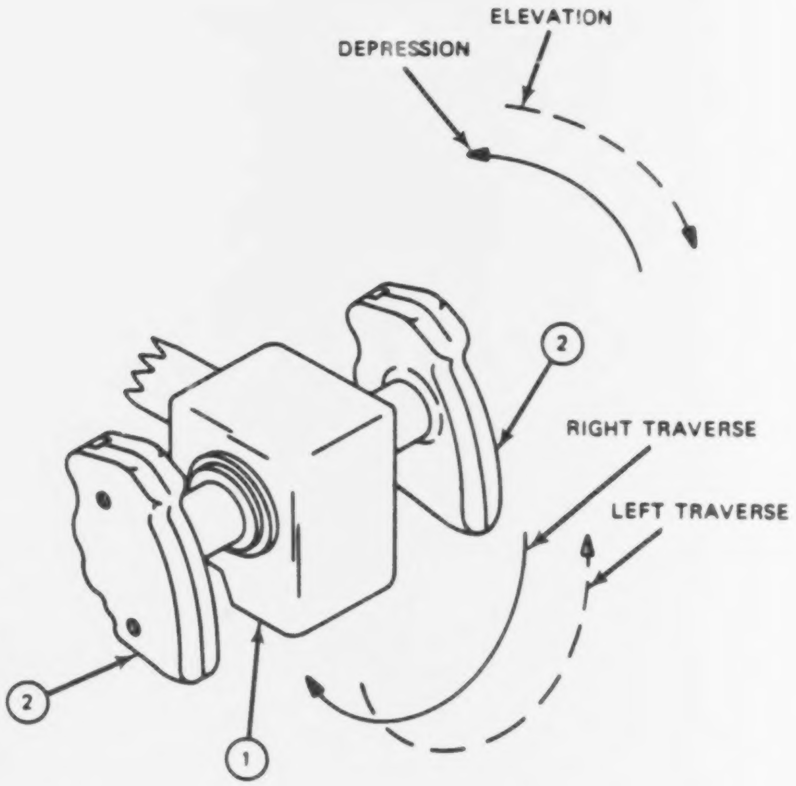
If normal indication is not obtained, adjust gunner's control (para 13-79), then repeat this frame. If normal indication is still not obtained, elevating arm or handles may be bending or hydraulic valve may be bad.

Step	Procedure	Normal Indication	Probable Fault
1.	Place gunner's control (1) on surface so that handles (2) extend over edge to allow full movement.	. . .	. . .
2.	Rotate handles (2) to full rearward position (elevation).	Handles move smoothly to about 30 degrees.	Gunner's control out of adjustment, elevating arm, handles, hydraulic valve
3.	Rotate handles (2) to full forward position (depression).	Handles move smoothly to about 30 degrees.	Gunner's control out of adjustment, elevating arm, handles, hydraulic valve
4.	If movement in steps 2 and 3 are not equal, adjust elevation or depression stopscrews (one that has least movement).	Equal movement	Gunner's control out out adjustment, elevating arm, handles, hydraulic valve
5.	With handles (2) released, they should be centered horizontally.	Handles horizontal	Gunner's control out of adjustment
6.	Rotate handles (2) to full right traverse and left traverse. Release handles.	Handles move smoothly and return to center position when released.	Gunner's control out of adjustment, hydraulic valve

NOTE

If normal indication was obtained in frames 1 through 3, gunner's control is good.

END OF TASK


ELEVATION
DEPRESSION
2
RIGHT TRAVERSE
LEFT TRAVERSE
2
1

13-73. GUNNER'S CONTROL ADJUSTMENT PROCEDURE

TOOLS: 7/16" combination wrench (two)
Slip joint pliers
6" machinist steel rule (two)

SUPPLIES: Paper
Pencil

PERSONNEL: Two

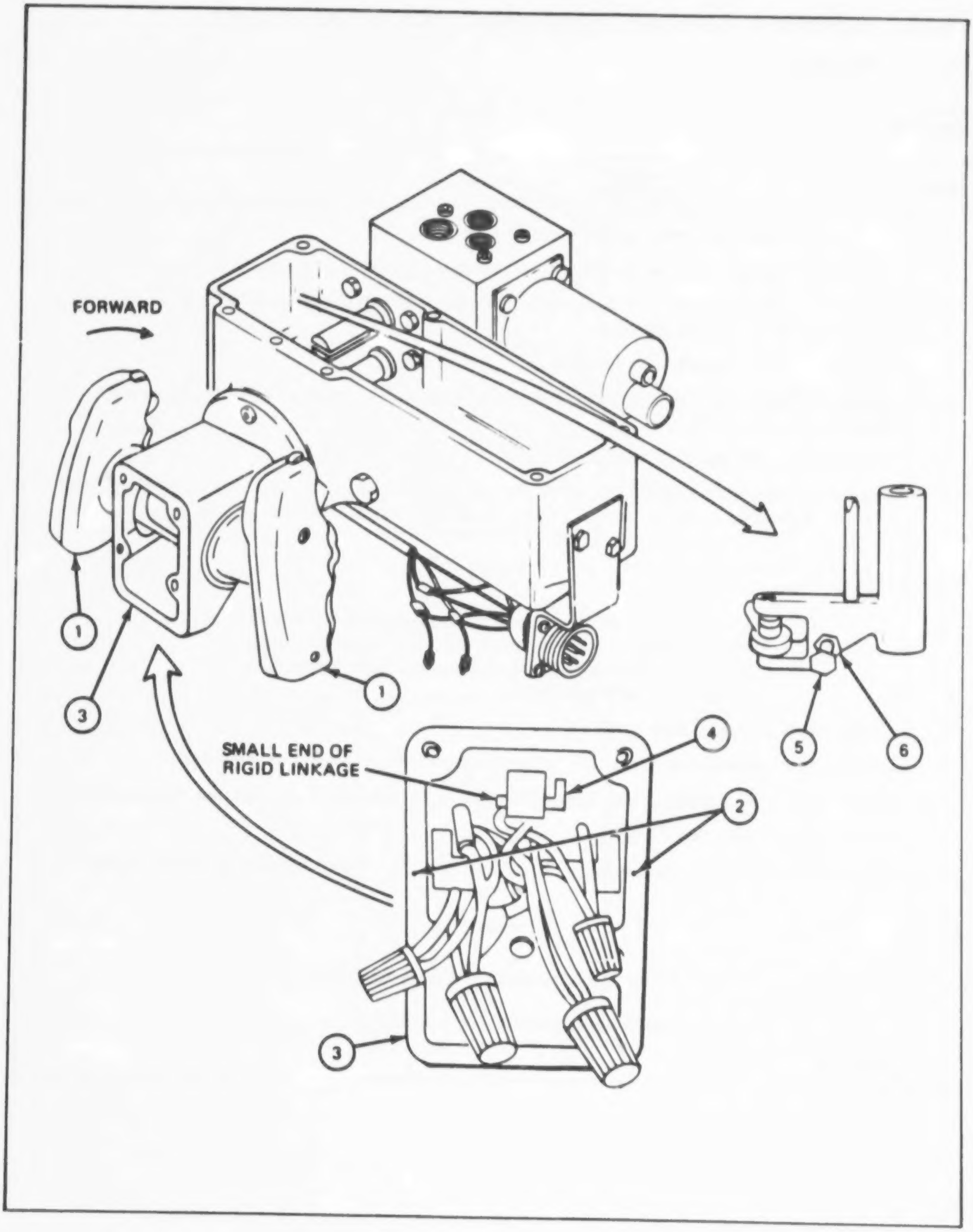
PRELIMINARY PROCEDURES: Assemble gunner's control (para 13-75)
Test gunner's control (para 13-72)
Remove housing cover (para 13-89)
Remove control box cover (para 13-76)

13-73. GUNNER'S CONTROL ADJUSTMENT PROCEDURE (CONT)

a. Depression

FRAME 1

Step	Procedure
	NOTE Elevation and depression travel should be approximately the same. If travel is not equal, adjustment of depression or elevation (frame 2) stopscrew must be made.
1.	Soldier A: Move gunner's control handles (1) forward to depression stop and hold handles there until measurements and adjustments are done.
2.	Soldier B: Place rule across cover mounting surfaces (2) of box (3).
3.	Place second rule against small part of rigid linkage (4) and measure distance from rigid linkage to cover mounting surface (2). Measurement should be between 1-11/32" and 1-13/32".
	NOTE Do steps 4 thru 6 only if adjustment is needed. If measurement is too short, depression stop screw (5) must be screwed in. If measurement is too long, depression stop screw (5) must be screwed out.
4.	Using wrench, loosen jam nut (6).
5.	Using wrench, adjust depression stop screw (5) until measurement in step 3 is obtained.
6.	Using two wrenches, hold depression stop screw (5) from turning while tightening jam nut (6).
	GO TO FRAME 2

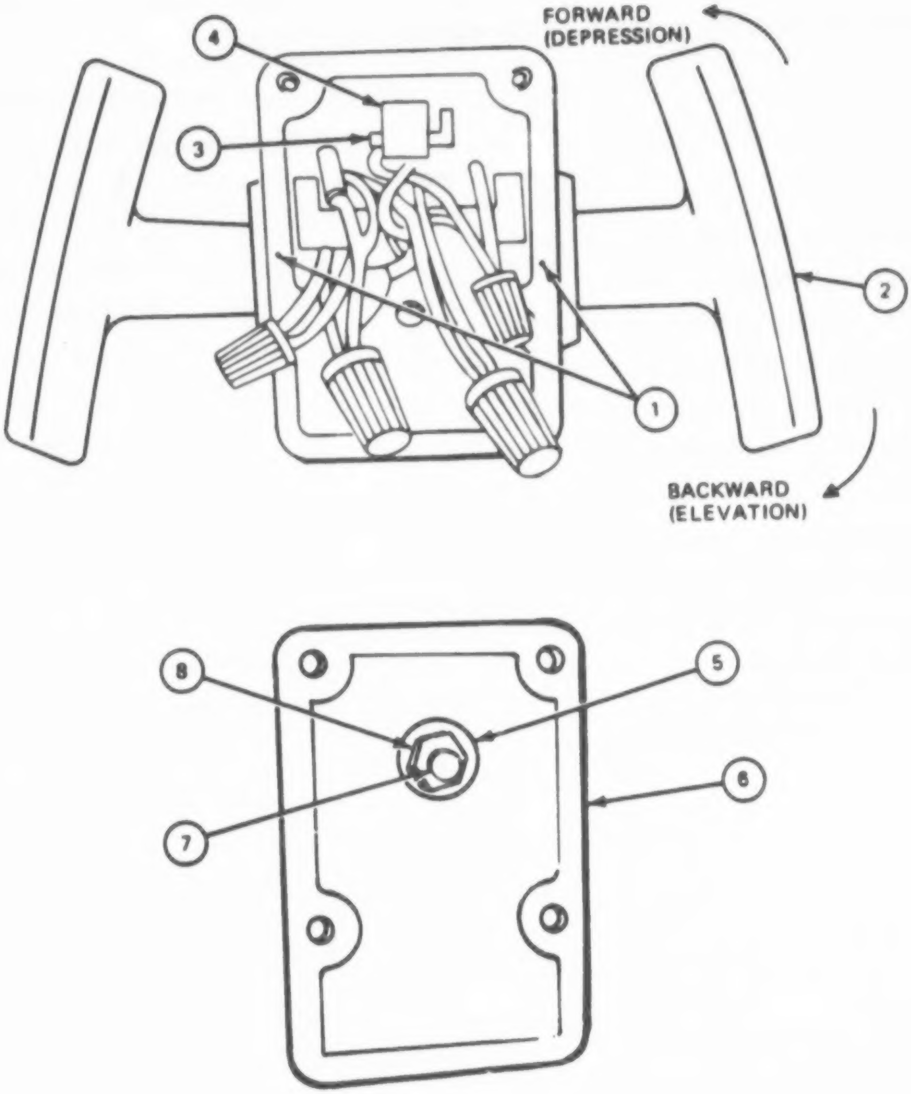

FORWARD
SMALL END OF
RIGID LINKAGE

13-73. GUNNER'S CONTROL ADJUSTMENT PROCEDURE (CONT)

b. Elevation

FRAME 2

Step	Procedure
1.	Soldier A: Place one ruler across mounting surfaces (1).
2.	Set end of second ruler at 21/32" from mounting surfaces (1) (first ruler).
3.	Soldier B: Move handles (2) backward (elevation) slowly until small end of rigid linkage (3) just touches second ruler.
4.	Soldier B: Hold handles (2) in place.
5.	Soldier A: Move second ruler and measure distance from rod end (4) to mounting surfaces (1) (first ruler).
6.	Using paper and pencil, record reading.
7.	Measure distance from boss (5) on inside of control box cover (6) to end of stop screw (7). Measurement must be within 1/32" of measurement recorded in step 5.
	NOTE Do steps 8 through 10 only if adjustment is needed. If measurement is too long, stop screw (7) must be turned clockwise. If measurement is too short, stop screw must be turned counterclockwise.
8.	Using wrench, loosen jam nut (8).
9.	Using pliers, adjust stop screw (7) until measurement in step 5 is obtained.
10.	Using wrench and pliers, hold stop screw (7) from turning while tightening jam nut (8).
11.	Install control box cover (6) (para 13-83).
12.	Check elevation/depression movement of handles (2). Travel should be about equal.
	NOTE Follow-on Maintenance Action Required: Install housing cover (para 13-90)
	END OF TASK


FORWARD
(DEPRESSION)
BACKWARD
(ELEVATION)

13-74. GUNNER'S CONTROL DISASSEMBLY PROCEDURE

PERSONNEL: One

REFERENCES: TM 9-2350-257-20-2-3 for procedure to remove gunner's control assembly

EQUIPMENT CONDITION: Gunner's control removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Test gunner's control (para 13-72)

FRAME 1

Step	Procedure
1.	Remove control box cover (para 13-76).
2.	Remove handles (para 13-81).
3.	Disassemble handles (para 13-83).
4.	Remove and disassemble control box (para 13-86).
5.	Remove housing cover (para 13-89).
6.	Remove traversing and elevating arms and disassemble housing (para 13-93).
7.	Disassemble traversing arm (para 13-95).
8.	Remove harness and bracket (para 13-78).
9.	Remove hydraulic valve (para 13-98).
10.	Disassemble hydraulic valve (para 13-106).
	END OF TASK

13-75. GUNNER'S CONTROL ASSEMBLY PROCEDURE

PERSONNEL: One

FRAME 1

Step	Procedure
1.	Assemble hydraulic valve (para 13-107).
2.	Install hydraulic valve (para 13-99).
3.	Install harness and bracket (para 13-79).
4.	Assemble traversing arm (para 13-96).
5.	Install traversing and elevating arms and assemble housing (para 13-94).
6.	Install housing cover (para 13-90).
7.	Assemble and install control box (para 13-87).
8.	Assemble handles (para 13-84).
9.	Install handles (para 13-82).
10.	Install control box cover (para 13-77).
	NOTE Follow-on Maintenance Action Required: Test gunner's control (para 13-72).
	END OF TASK

13-76. CONTROL BOX COVER REMOVAL PROCEDURE

TOOLS: 5/32" socket head screw key (Allen wrench)
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Clean parts
Inspect and repair parts

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Gunner's Control Box	FO-1	2
Turret Traverse Lock	FO-4	6

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Gunner's control box ELEV/TRAV switch set to OFF
Turret traverse lock set to LOCKED

GENERAL INSTRUCTIONS:

NOTE

Equipment conditions apply only if task is being done on vehicle.

13-76. CONTROL BOX COVER REMOVAL PROCEDURE (CONT)

FRAME 1

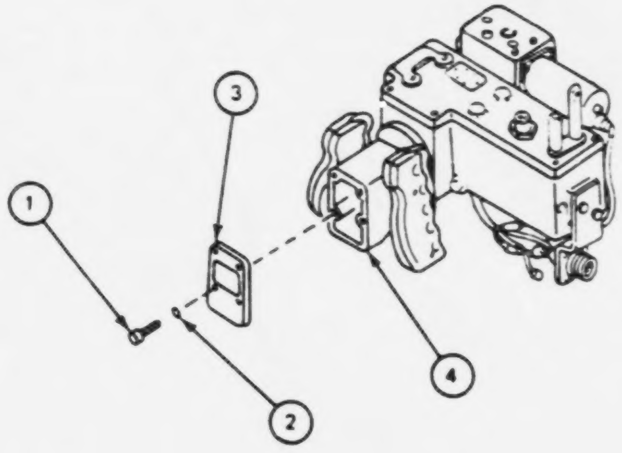
Step	Procedure
1.	Using Allen wrench, remove four screws (1) and four lockwashers (2) that attach control box cover (3) to control box (4).
2.	Remove cover (3) from control box (4).

NOTE

Follow-on Maintenance Action Required:

Clean all parts (JPG).
Inspect and repair all parts (JPG).

END OF TASK



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13-77. CONTROL BOX COVER INSTALLATION PROCEDURE (CONT)

TOOLS: 5/32" socket head screw key (Allen wrench)

PERSONNEL: One

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Gunner's Control Box	FO-1	2
Gunner's Control	FO-1	5

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Gunner's control box ELEV/TRAV switch set to OFF

GENERAL INSTRUCTIONS:

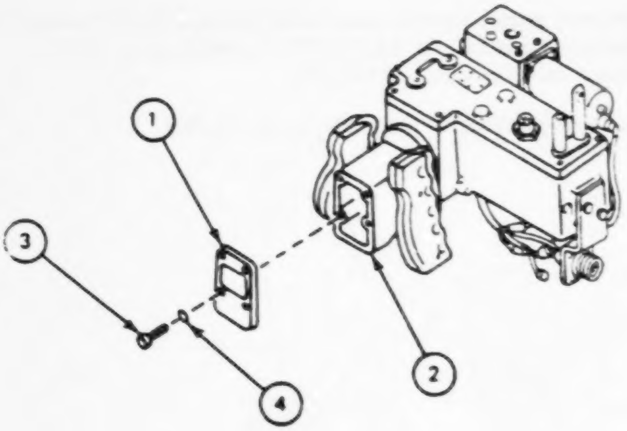
NOTE

Equipment conditions apply only if task is being done on vehicle.

13-77. CONTROL BOX COVER INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
i.	Place control box cover (1) on control box (2).
2.	Using Allen wrench, attach cover (1) to control box (2) with four screws (3) and four lockwashers (4). END OF TASK



13-78. HARNESS AND BRACKET REMOVAL PROCEDURE

TOOLS: 1/4" flat tip screwdriver
7/16" open end wrench
Diagonal cutting pliers
Slip joint pliers with plastic jaws (connector)

SUPPLIES: Masking tape (item 36, App. A)
Pencil

PERSONNEL: One

REFERENCES: JPG for procedures to:
Disconnect electrical connectors
Tag wires
Remove sealing compound
TM 9-2350-257-20-2-3 for procedure to lower hydraulic system pressure

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control panel	FO-4	10
Gunner's Control Box	FO-1	2
Turret Traverse Lock	FO-4	6
Gunner's Control	FO-1	5

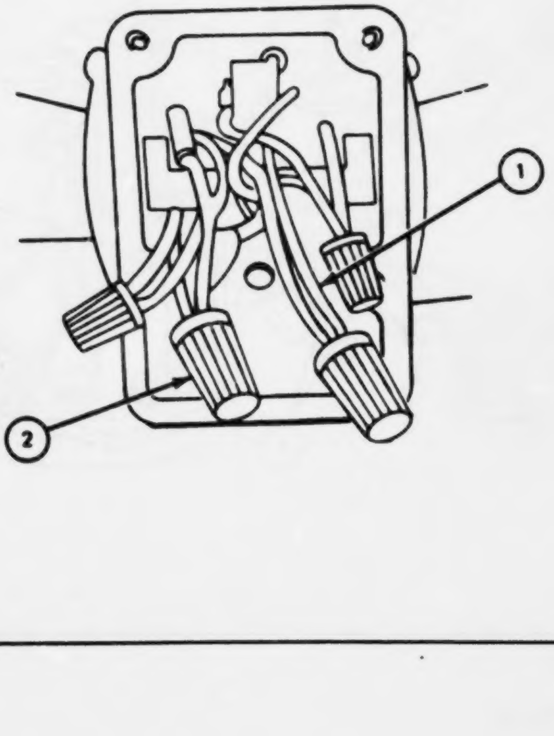
EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Gunner's control box ELEV/TRAV switch set to OFF
Turret traverse lock to LOCKED

PRELIMINARY PROCEDURES: Remove control box cover (para 13-76)

13-78. HARNESS AND BRACKET REMOVAL PROCEDURE (CONT)

FRAME 1

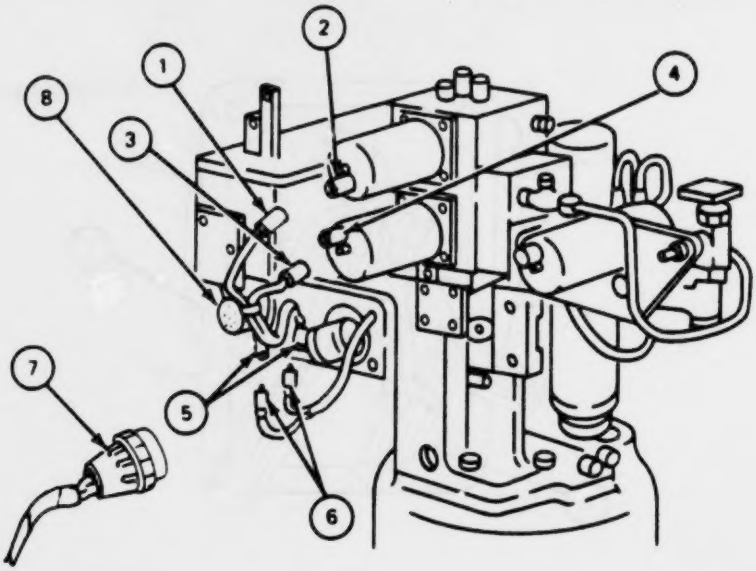
Step	Procedure
	WARNING Before doing work on gunner's control, hydraulic system pressure must be lowered to 0 psi, or you could get hurt by movement of turret or gun.
1.	Lower hydraulic system pressure to 0 psi (TM-20-2-3).
2.	Using masking tape and pencil, tag and mark all wires (1) to be removed from four connector nuts (2) (JPG).
3.	Using cutting pliers, cut wires (1) at four connector nuts (2).
	GO TO FRAME 2



13-78. HARNESS AND BRACKET REMOVAL PROCEDURE (CONT)

FRAME 2

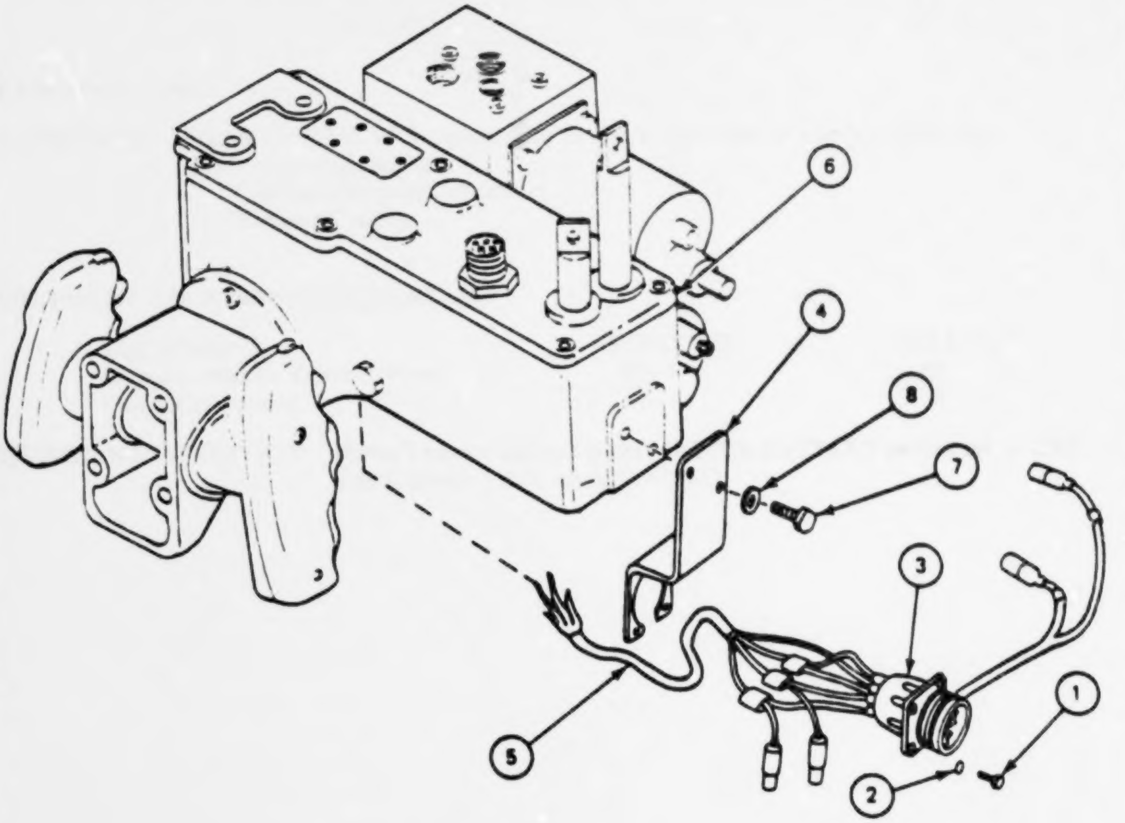
Step	Procedure
1.	Using hands, disconnect electrical connector (1) from power solenoid (2) (JPG).
2.	Using hands, disconnect electrical connector (3) from override solenoid (4) (JPG).
	NOTE Do steps 3 and 4 only if gunner's control assembly is mounted in vehicle.
3.	Using masking tape and pencil, tag wires connected to electrical connectors (5), manual elevation pump connectors (6), electrical connector (7) and wiring harness connector (8) (JPG)
4.	Using hands, disconnect two electrical connectors (5) from two manual elevation pump connectors (6) (JPG).
5.	Using connector pliers, remove electrical connector (7) from wiring harness connector (8) (JPG).
	GO TO FRAME 3



13-78. HARNESS AND BRACKET REMOVAL PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Using screwdriver, remove four screws (1) and four lockwashers (2) that attach electrical connector (3) to bracket (4).
2.	Using hands, pull wiring harness (5) out of gunner's control housing (6).
3.	Using wrench, remove two screws (7) and two lockwashers (8) that attach bracket (4) to gunner's control housing (6). END OF TASK



13-79. HARNESS AND BRACKET INSTALLATION PROCEDURE

TOOLS: Needle nose pliers
Slip joint pliers with plastic jaws (connector pliers)
1/8" flat tip screwdriver
No. 2 cross tip screwdriver (Phillips)
7/16" open end wrench

SUPPLIES: Nut (8735997) (large)
Screw (8735998) (for large nut)
Insert (8735996) (for large nut)
Nut (8735994) (small)
Screw (8735995) (for small nut)
Insert (8735993) (for small nut)
0.032" lockwire (18" long)
Masking tape (item 36. App. A)

PERSONNEL: One

REFERENCES: TM 9-2350-257-10 for procedure to check operation of gun firing circuits
JPG for procedures to:
Connect electrical connectors
Terminate wires

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Gunner's Control	FO-1	5

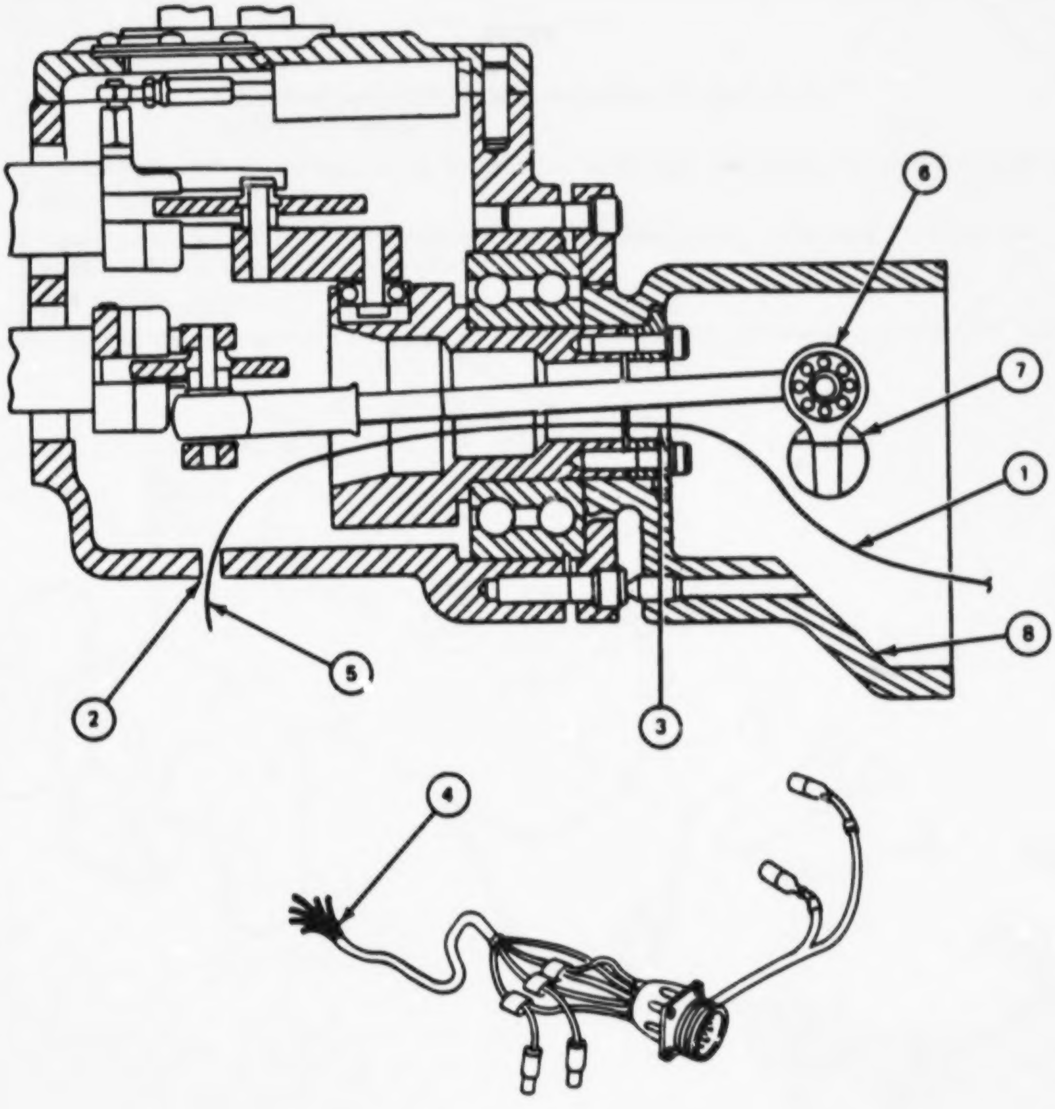
EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Turret traverse lock set to LOCKED

13-79. HARNESS AND BRACKET INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using needle nose pliers, thread lockwire (1) through hole in bottom of housing (2) and out through hole in cam (3).
2.	Using masking tape, tape ends of wiring harness (4) to end of lockwire (5). **NOTE** Wires should be clear of elevation eyebolt (6) and under shaft (7).
3.	Pull lockwire (1) and harness wire (4) through hole (2), cam hole (3), and out gunner's control box (8).
4.	Remove tape and lockwire (1) from wiring harness (4). GO TO FRAME 2

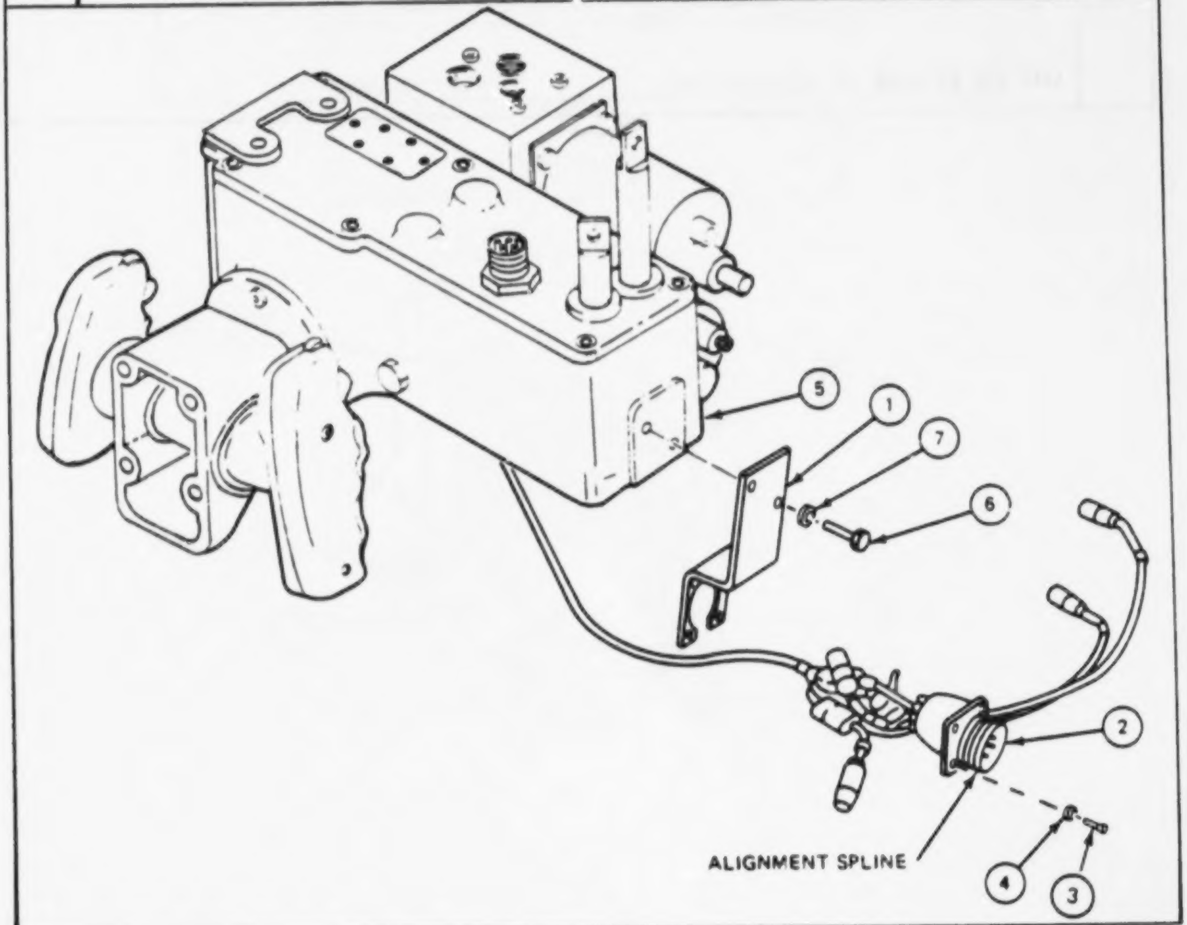
Para 13-79 Cont



13-79. HARNESS AND BRACKET INSTALLATION PROCEDURE (CONT)

FRAME 2

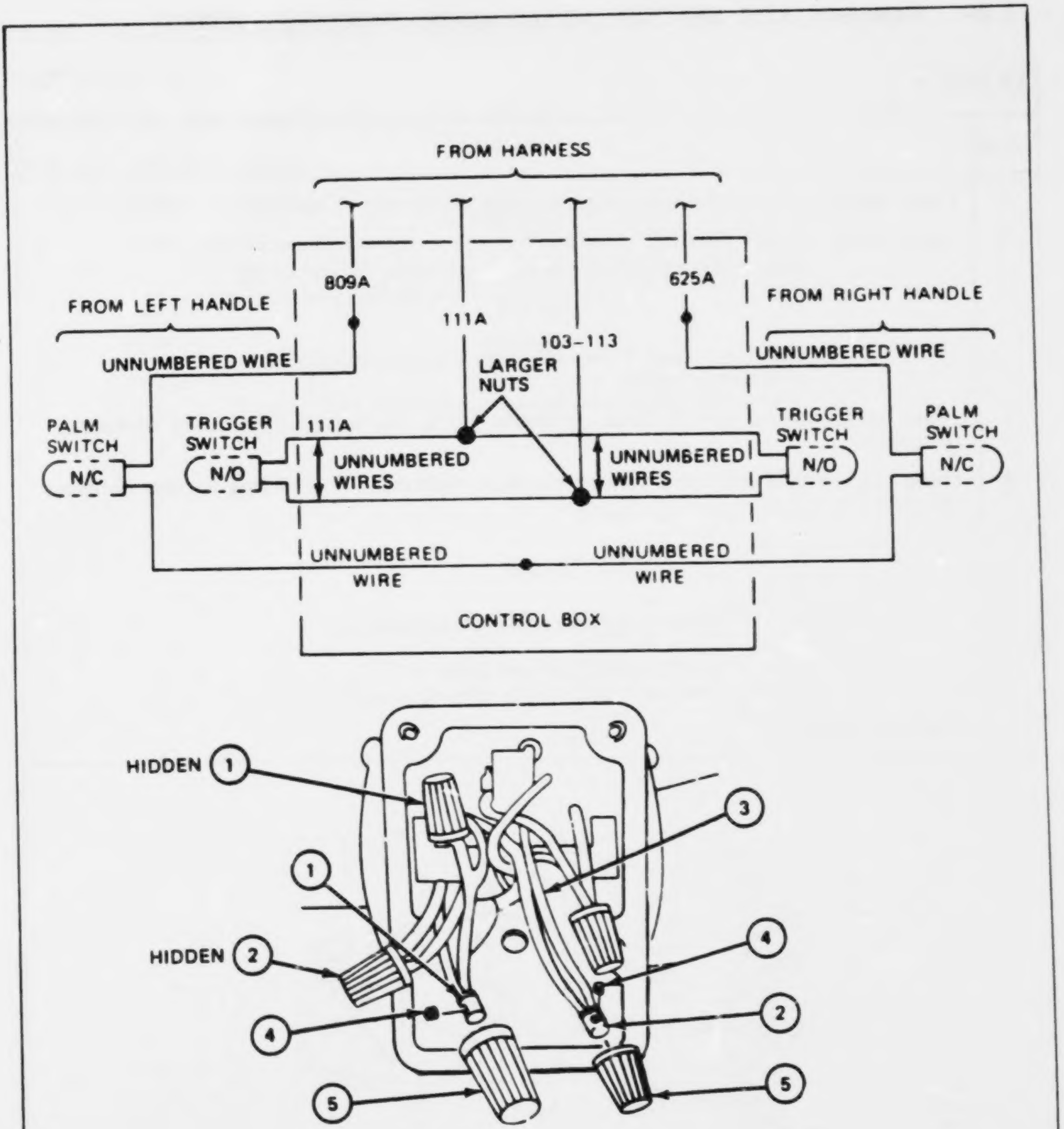
Step	Procedure
	NOTE Alignment spline of harness connector (2) must be to bottom of bracket (1).
1.	Using cross tip screwdriver, attach bracket (1) to harness connector (2) with four screws (3) and four lockwashers (4).
2.	Using open end wrench, attach harness connector bracket (1) to housing (5) with two screws (6) and two lockwashers (7). GO TO FRAME 3



13-79. HARNESS AND BRACKET INSTALLATION PROCEDURE (CONT)

FRAME 3

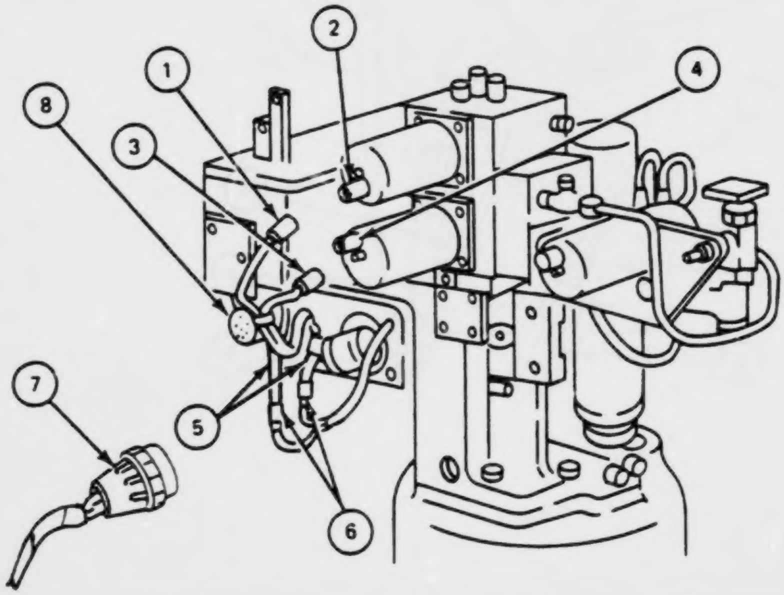
Step	Procedure
	NOTE Insulation stripping and replacement of nuts, inserts, and screws are required for wires that were cut off during removal of harness. Wires were tagged during removal. If tags were lost, use schematic (JPG). Two inserts (1) holding three wires, are larger than two inserts (2) holding two wires.
1.	Using flat tip screwdriver, attach wires (3) to four inserts with four screws (4).
2.	Using hands, screw four connector nuts (5) on four inserts.
	GO TO FRAME 4


FROM HARNESS
809A
111A
103–113
625A
FROM LEFT HANDLE
FROM RIGHT HANDLE
UNNUMBERED WIRE
UNNUMBERED WIRE
LARGER NUTS
PALM SWITCH
N/C
TRIGGER SWITCH
N/O
111A
UNNUMBERED WIRES
UNNUMBERED WIRES
TRIGGER SWITCH
N/O
PALM SWITCH
N/C
UNNUMBERED WIRE
UNNUMBERED WIRE
CONTROL BOX
HIDDEN 1
3
1
4
HIDDEN 2
4
2
5
5

13-79. HARNESS AND BRACKET INSTALLATION PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Using hands, connect electrical connector 625A (1) to power solenoid (2) (JPG).
2.	Using hands, connect electrical connector 623 (3) to override solenoid (4) (JPG).
	NOTE Do steps 3 and 4 only if gunner's control assembly is mounted in vehicle.
3.	Using hands, connect two electrical connectors (5) to manual elevation pump connectors (6) (JPG).
4.	Using pliers with plastic jaws, connect electrical connector (7) to wiring harness connector (8) (JPG).
	NOTE Follow-on Maintenance Action Required: Install control box cover (para 13-77). Check operation of gun firing circuits (TM-10).
	END OF TASK



13-80. HANDLE INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Disassemble handle (para 13-83)

GENERAL INSTRUCTIONS:

NOTE

This procedure is for inspection of either left or right, early or late model handles.

NOTE

If part is bad, order repair part or next higher assembly as required.

13-80. HANDLE INSPECTION PROCEDURE (CONT)

FRAME 1

Step **Procedure**

SUPPORT SHOP WORK

1. Take handle parts to shop where inspection equipment is available.
2. Make dimensional checks.

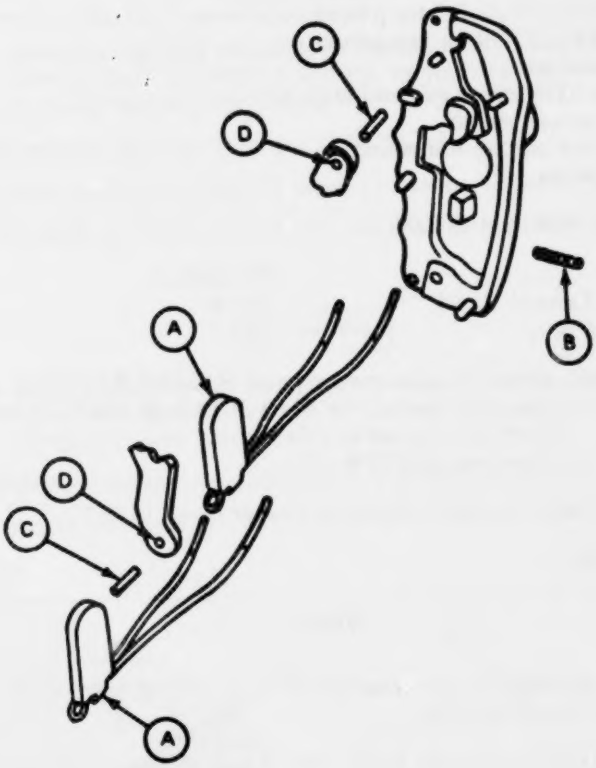
Reference Number	Point of Measurement	Measurement	
		Early Model	Late Model
A	Switches:		
	Pretravel	0.020 minimum	0.045 minimum
	Overtravel	0.010 minimum	0.010 minimum
	Operating effort at center of switch	16 to 32 oz	16 to 32 oz
B	Spring:		
	Force required to compress spring to 0.703	0.27 to 0.33 oz	0.27 to 0.33 oz
	Force required to compress spring to 0.547	0.60 to 0.72 oz	0.60 to 0.72 oz
C	OD of pins	0.1855 to 0.1875	0.1855 to 0.1875
D	Diameter of hole in triggers	0.1880 to 0.1910	0.1880 to 0.1910

NOTE

Tag parts that are out of tolerance.

3. After shop support, return parts to turret shop.

END OF TASK


C
D
B
A
D
C
A

13-81. HANDLE REMOVAL PROCEDURE

TOOLS: Diagonal cutting pliers
1/8" socket head screw key (Allen wrench)

SUPPLIES: Masking tape (item 36, App. A)
Pencil

PERSONNEL: One

REFERENCES: TM 9-2350-257-20-2-3 for procedure to lower hydraulic system pressure
TM 9-2350-257-10 for procedures to:
- Unload guns
- Turn off machine gun and main gun

JPG for procedures to:
- Remove sealing compound
- Tag wires

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Gunner's Control Box	FO-1	2

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Gunner's control box ELEV/TRAV, MAIN GUN and MACHINE GUN switches set to OFF
Guns unloaded (TM-10)

PRELIMINARY PROCEDURES: Remove control box cover (para 13-76)

GENERAL INSTRUCTIONS:

NOTE

This procedure is for removal of either left or right, early or late model handles.

Equipment conditions apply only if task is being done on vehicle.

13-81. HANDLE REMOVAL PROCEDURE (CONT)

FRAME 1

Step **Procedure**

WARNING

Before doing work on gunner's control, hydraulic system pressure must be reduced to 0 psi, or you could get hurt by movement of turret or gun.

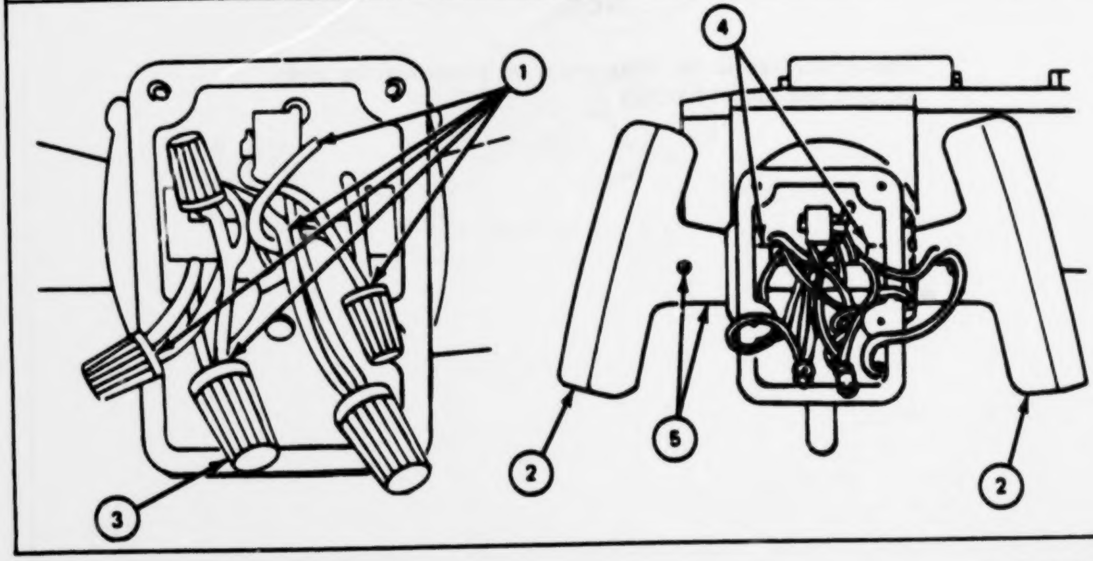
1. Lower hydraulic system pressure to 0 psi (TM-20-2-3).
2. Using masking tape and pencil, tag all wires (1) to be removed with handles (2) (JPG).
3. Using pliers, cut wires (1) from handle (2) switches at connector nuts (3).

CAUTION

During removal of handles (2), switch wires (1) should be slowly guided through shaft hole (4) to prevent damage to wire insulation.

4. Using Allen wrench, remove four setscrews (5) from two handles (2).
5. Using hands, remove two handles (2).

END OF TASK



13-82. HANDLE INSTALLATION PROCEDURE

TOOLS: Pocket knife
1/8" socket head screw key (Allen wrench)
1/8" flat tip screwdriver
Needle nose pliers

SUPPLIES: Nut, large (8735997)
Screw (8735998) (for large nut)
Insert (8735996) (for large nut)
Nut, small (8735994)
Screw (8735995) (for small nut)
Insert (8735993) (for small nut)

PERSONNEL: One

REFERENCES: TM 9-2350-257-10 for procedure to check operation of gun firing circuit

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Gunner's Control Box	FO-1	2
Gunner's Control Handles	FO-1	26

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Gunner's control box ELEV/TRAV switch set to OFF

GENERAL INSTRUCTIONS:

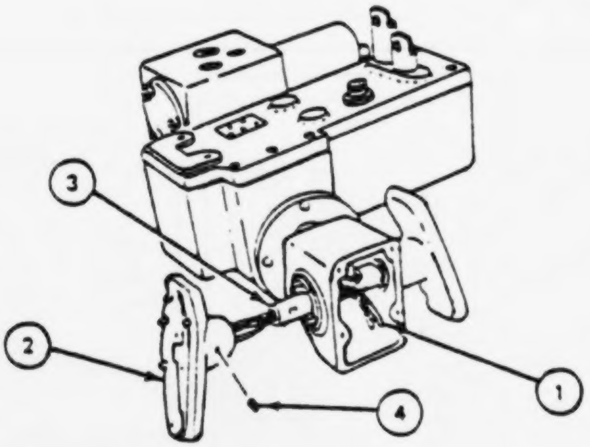
NOTE

This procedure is for installation of either left or right, early or late model handles.

13-82. HANDLE INSTALLATION PROCEDURE (CONT)

FRAME 1

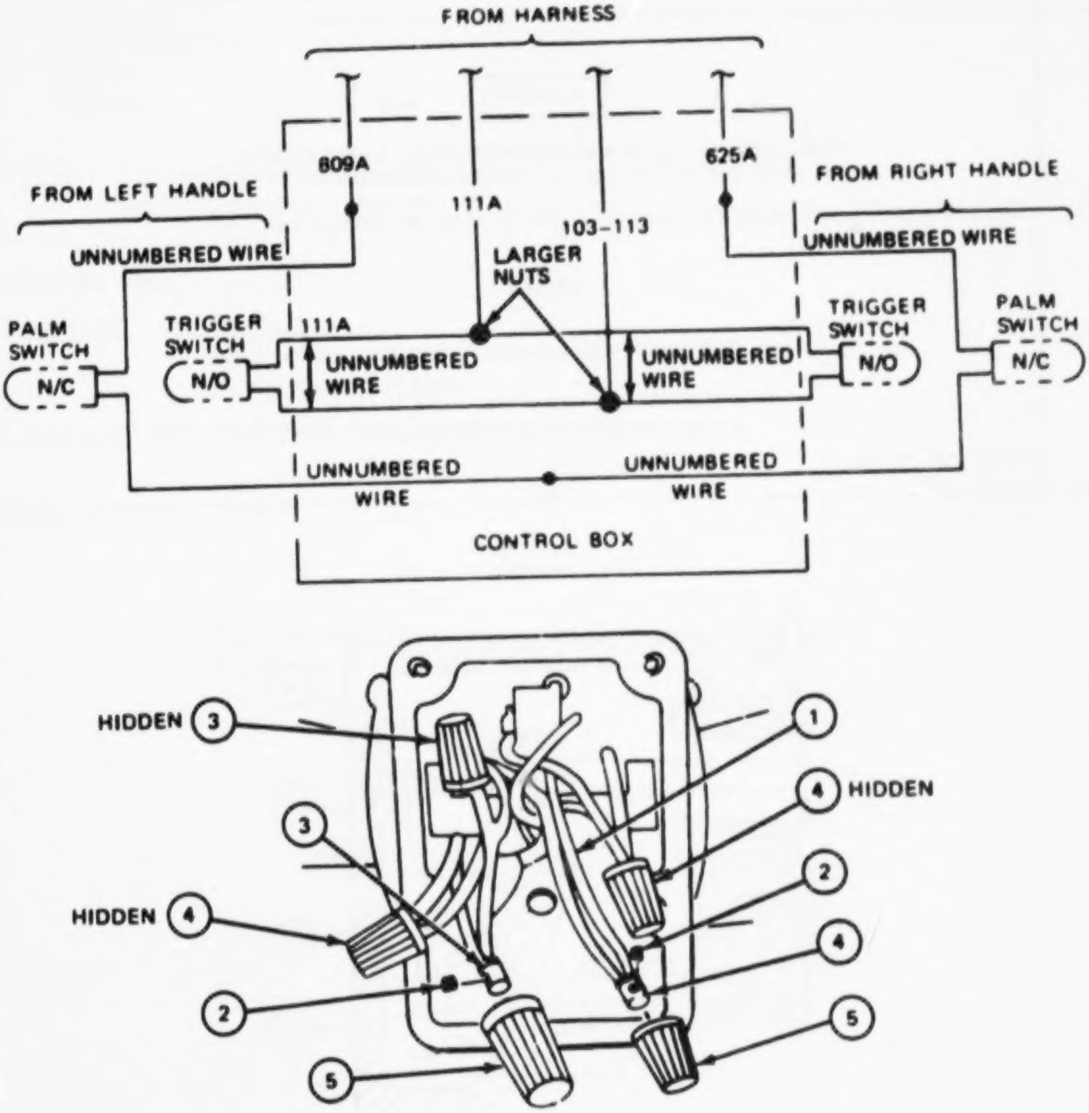
Step	Procedure
	NOTE It may be necessary to use pliers to pull wires (1) through shaft (3).
1.	Put four wires (1) from handle (2) through hole in shaft (3).
2.	Put handle (2) on shaft (3) with setscrew holes lined up with flat surfaces on shaft.
3.	Using 1/8" Allen wrench, attach handle (2) to shaft (3) with two setscrews (4).
	GO TO FRAME 2



13-82. HANDLE INSTALLATION PROCEDURE (CONT)

FRAME 2

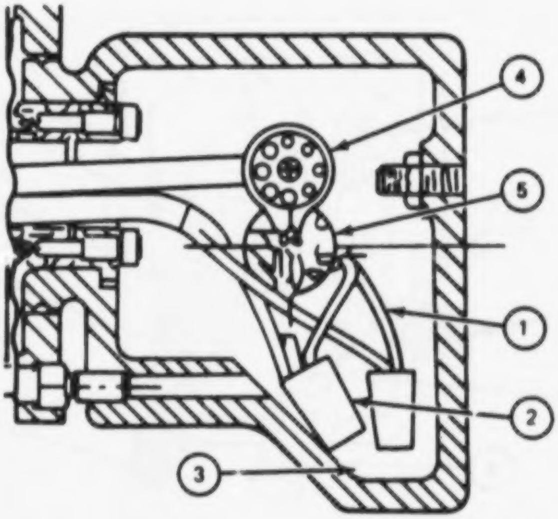
Step	Procedure
	NOTE Insulation stripping and replacement of nuts, inserts, and screws are required for wires that were cut off during removal. Wires were tagged during removal. If tags were lost, use schematic (JPG).
1.	Using pocket knife, remove insulation off wires (1) so about 1/2" of wire is exposed.
	NOTE Two inserts (3), holding three wires, are larger than three inserts (4) holding two wires.
2.	Using screwdriver, attach wires (1) to five inserts (3) and (4) with five screws (2).
3.	Using hands, screw five connector nuts (5) on five inserts.
	GO TO FRAME 3


FROM HARNESS
809A
111A
103-113
625A
FROM LEFT HANDLE
FROM RIGHT HANDLE
UNNUMBERED WIRE
UNNUMBERED WIRE
LARGER NUTS
PALM SWITCH
N/C
TRIGGER SWITCH
N/O
111A
UNNUMBERED WIRE
UNNUMBERED WIRE
TRIGGER SWITCH
N/O
PALM SWITCH
N/C
UNNUMBERED WIRE
UNNUMBERED WIRE
CONTROL BOX
HIDDEN 3
1
4 HIDDEN
3
2
HIDDEN 4
4
2
5
5

13-82. HANDLE INSTALLATION PROCEDURE (CONT)

FRAME 3

Step	Procedure
	CAUTION Make sure wires (1) and connector nuts (2) are clear of elevation control linkage (4) and under shaft (5).
1.	Bend wires (1) and connector nuts (2) into bottom of control box (3).
	NOTE Follow-on Maintenance Action Required: Install control box cover (para 13-77). Check operation of gun firing circuits (TM-10)
	END OF TASK



13-83. HANDLE DISASSEMBLY PROCEDURE

TOOLS: 5/32" socket head screw key (Allen wrench)
5/64" socket head screw key (Allen wrench)
5/16" open end wrench
11/32" open end wrench
Slip joint pliers
Stiff bristled brush
Scraper
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Test gunner's control (para 13-72)
Remove handle (para 13-81)

GENERAL INSTRUCTIONS:

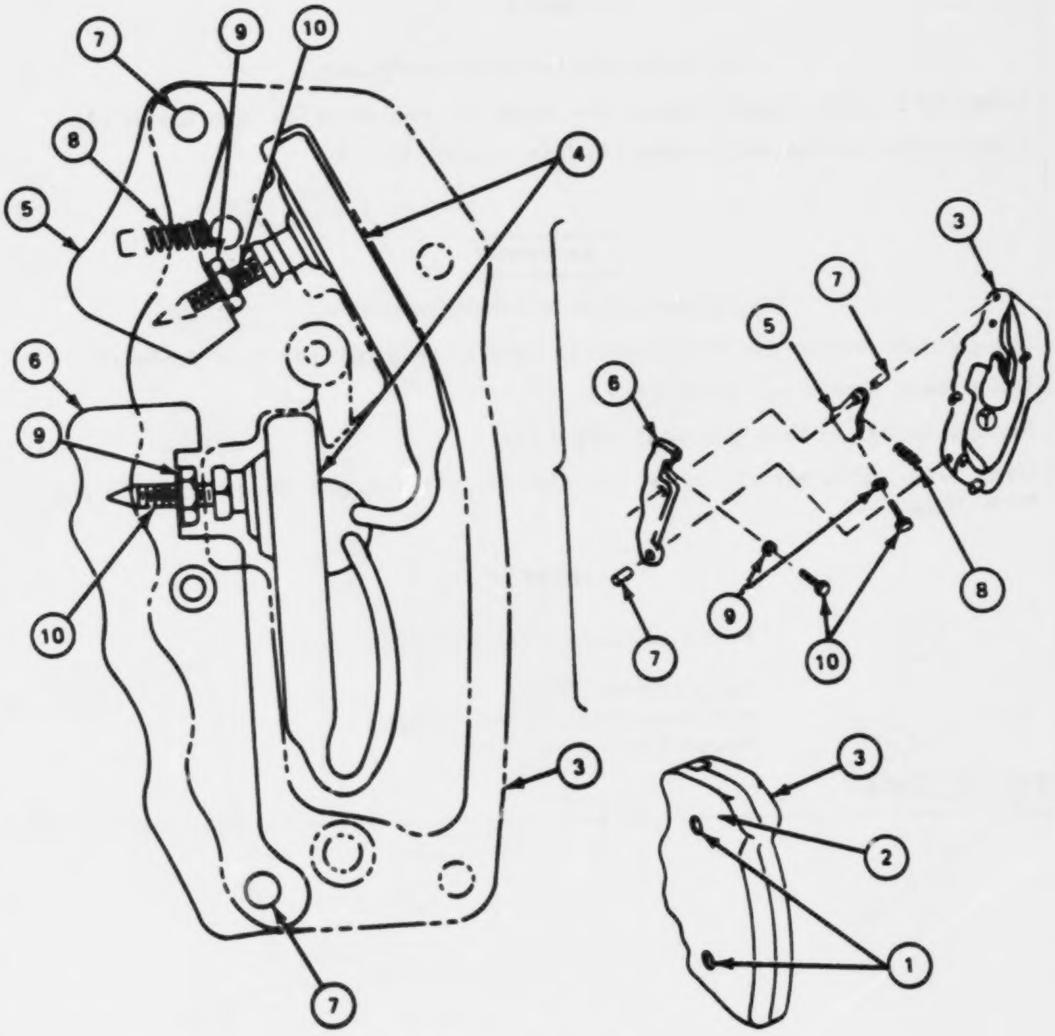
NOTE

This procedure is for disassembly of either left or right, early or late model handles.

13-83. HANDLE DISASSEMBLY PROCEDURE (CONT)

FRAME 1

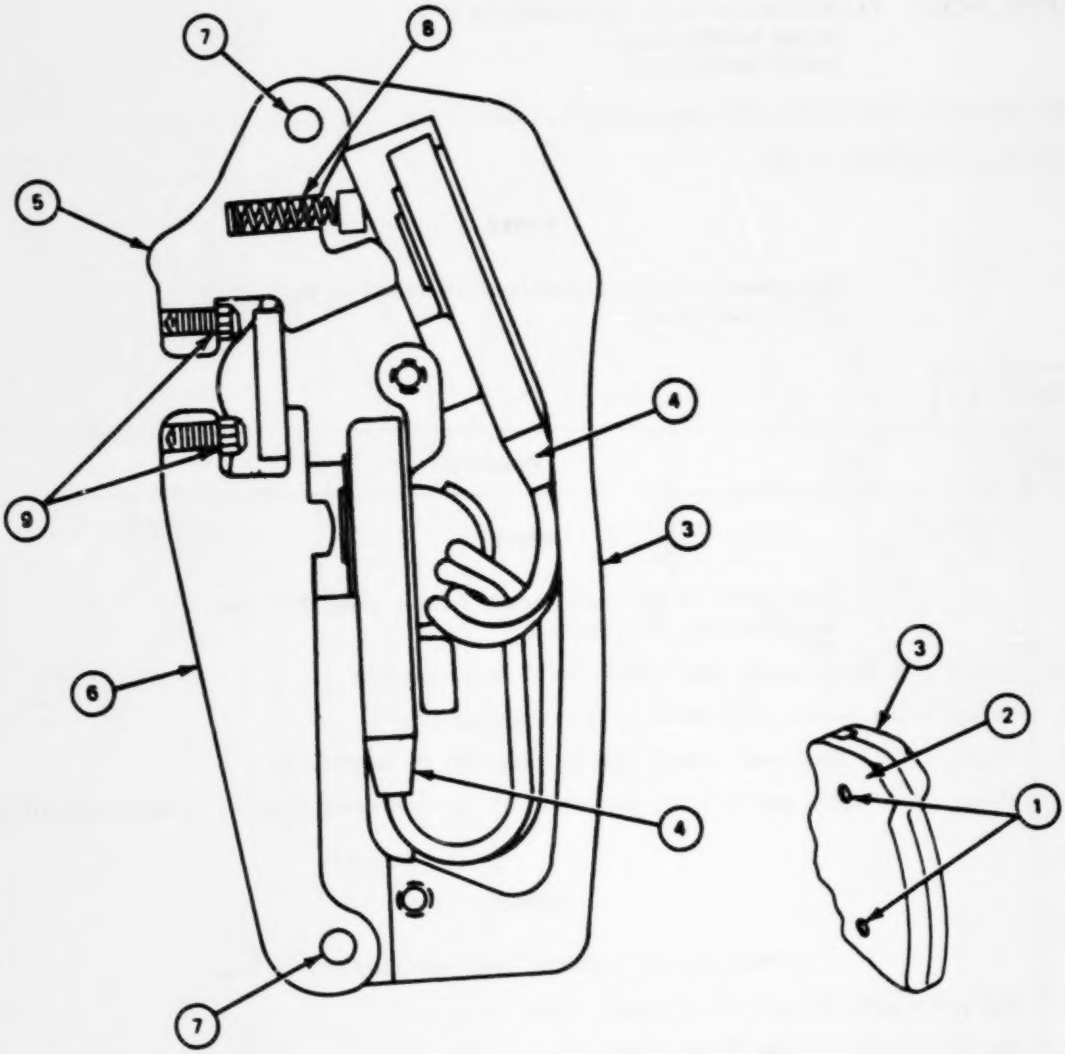
Step	Procedure
	NOTE This frame is for early model handle only. For late model handle, go to frame 2.
1.	Using 5/32" Allen wrench, remove two screws (1) and cover (2) from handle (3).
2.	Using hands, remove two switches (4) from handle (3).
	CAUTION Trigger spring (8) is held under compression.
3.	Using hands, remove gun firing trigger (5) and brake trigger (6) from handle (3).
4.	Using pliers, remove two pivot pins (7).
5.	Remove spring (8) from trigger (5).
6.	Using 11/32" open end wrench, loosen locknut (9) on gun firing trigger (5) and brake trigger (6).
7.	Using 5/16" open end wrench, remove screw (10) with locknut (9) from triggers (5) and (6).
8.	Using hands, remove two locknuts (9) from two screws (10).
	GO TO FRAME 2



13-83. HANDLE DISASSEMBLY PROCEDURE (CONT)

FRAME 2

Step	Procedure
	NOTE This frame is for late model handle only.
1.	Using 5/32" Allen wrench, remove two screws (1) and cover (2) from handle (3).
2.	Using hands, remove two switches (4) from handle (3).
	CAUTION Trigger spring (8) is held under compression.
3.	Using hands, remove gun firing trigger (5) and brake trigger (6) from handle (3).
4.	Using pliers, remove two pivot pins (7).
5.	Remove spring (8) from gun firing trigger (5).
6.	Using 5/64" Allen wrench, remove two setscrews (9) from gun firing trigger (5) and brake trigger (6).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Inspect handles (para 13-80).
	END OF TASK



13-84. HANDLE ASSEMBLY PROCEDURE

TOOLS: 5/64" socket head screw key (Allen wrench)
5/16" open end wrench
11/32" open end wrench

PERSONNEL: One

REFERENCES: TM 9-2350-215-20-2-3 for procedures to:
Adjust handle triggers
Install handle covers

PRELIMINARY PROCEDURES: Inspect handle (para 13-80)

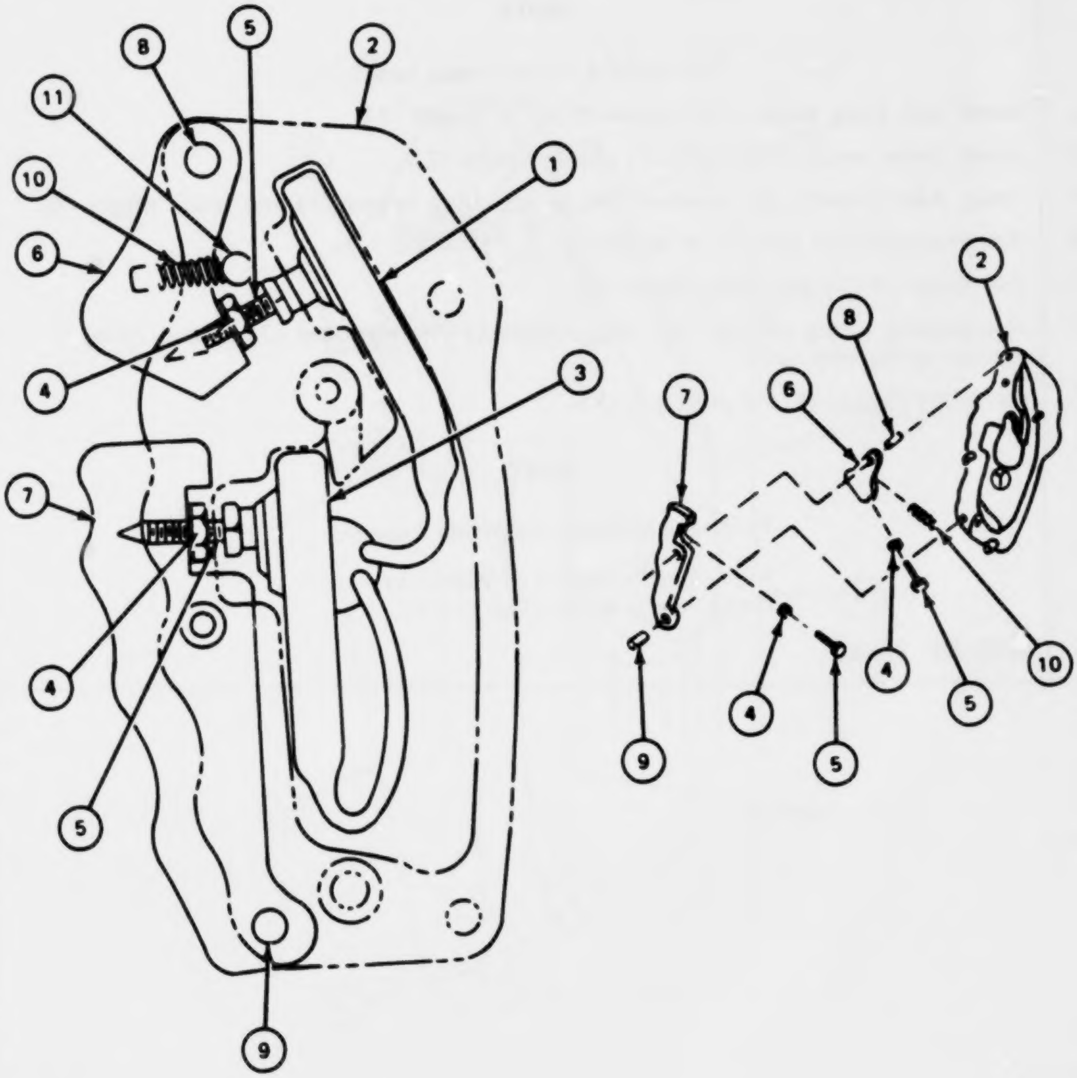
GENERAL INSTRUCTIONS:

NOTE

This procedure is for assembly of either left or right, early or late model handles.

FRAME 1

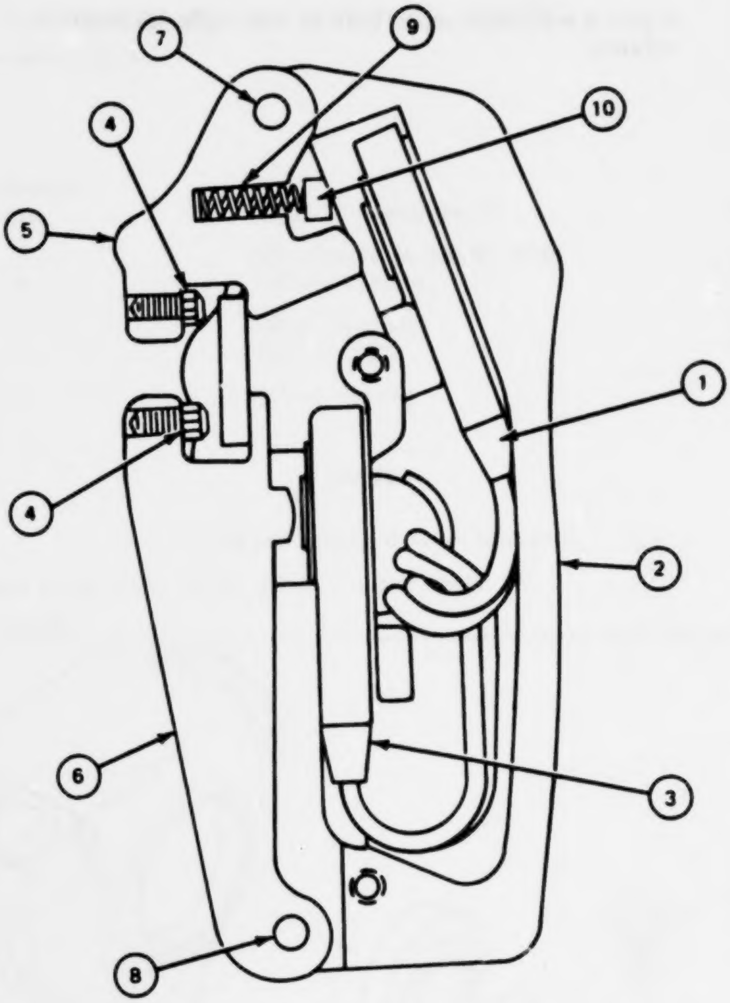
Step	Procedure
	NOTE This frame is for early model handle only. For late model handle, go to frame 2.
1.	Install gun firing switch (MS 39058-1) (1) in handle (2).
2.	Install brake switch (MS 39058-2) (3) in handle (2).
3.	Using 11/32" open end wrench, put locknuts (4) on screws (5).
4.	Using 5/16" open end wrench, put screws (5) in gun firing trigger (6) and brake trigger (7).
	NOTE Pivot pin (8) is shorter than pivot pin (9).
5.	Put pivot pins (8) and (9) in handle (2).
6.	Put spring (10) in gun firing trigger (6).
7.	Compressing spring (10), put gun firing trigger (6) on pivot pin (8) so that spring is against spring stop (11).
8.	Put brake trigger (7) on pivot pin (9).
	GO TO FRAME 2



13-84. HANDLE ASSEMBLY PROCEDURE (CONT)

FRAME 2

Step	Procedure
	NOTE This frame is for late model handle only.
1.	Install gun firing switch (MS 39058-1) (1) in handle (2).
2.	Install brake switch (MS 39058-2) (3) in handle (2).
3.	Using Allen wrench, put setscrews (4) in gun firing trigger (5) and brake trigger (6).
4.	Put pivot pins (7) and (8) in handle (2).
5.	Put spring (9) in gun firing trigger (5).
6.	Compressing spring (9), put gun firing trigger (5) on pivot pin (7) so that spring is against spring stop (10).
7.	Put brake trigger (6) on pivot pin (8).
	NOTE Follow-on Maintenance Action Required: Adjust handle triggers (TM-20-2-3). Install handle covers (TM-20-2-3).
	END OF TASK



13-85. CONTROL BOX INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Remove control box (para 13-86)

GENERAL INSTRUCTIONS:

NOTE

If part is bad, order repair parts or next higher assembly as required.

13-85. CONTROL BOX INSPECTION PROCEDURE (CONT)

FRAME 1

Step	Procedure
	SUPPORT SHOP WORK
1.	Take parts to shop where inspection equipment is available.
2.	Make dimensional checks.

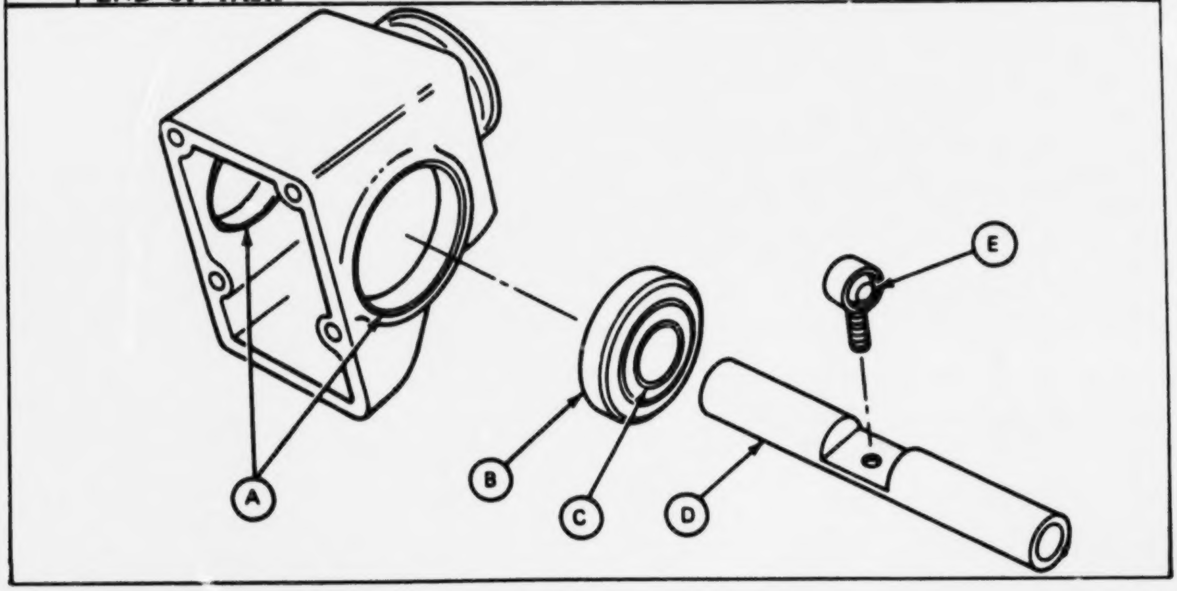
Reference Letter	Point of Measurement	Measurement
A	ID of bore in handle box	1.8503 to 1.8509
B	OD of bearing	1.8499 to 1.8504
C	ID of bearing	0.7870 to 0.7874
D	OD of shaft	0.7853 to 0.7868
E	ID of bearing	0.1895 to 0.1900

NOTE

Tag parts that are out of tolerance.

Step	Procedure
3.	After support shop work, return parts to turret shop.

END OF TASK



13-86. CONTROL BOX REMOVAL AND DISASSEMBLY PROCEDURE

TOOLS: Needle nose pliers
1/8" socket head screw key (Allen wrench)
3/8" drive speed handle
5/32" hex head socket (3/8" drive)
20 ounce ball peen hammer
1/4" drift pin punch
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

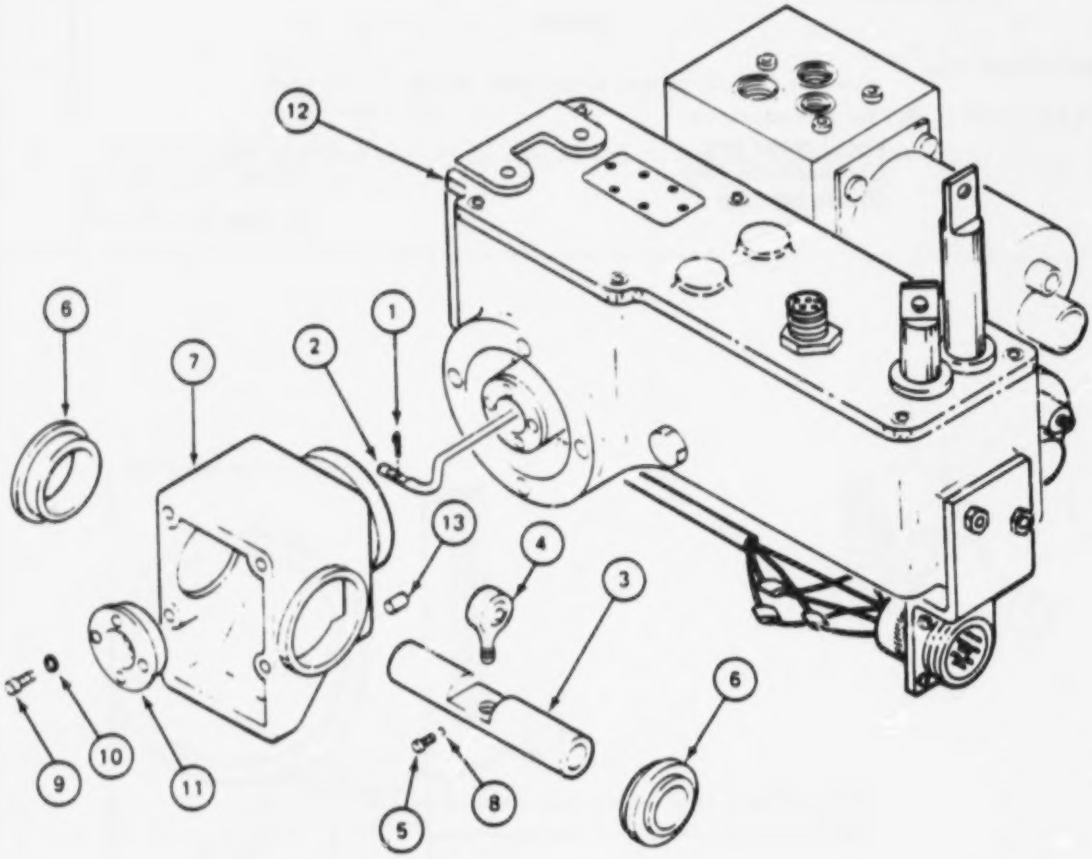
REFERENCES: JPG for procedures to:
Remove cotter pins
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove control box cover (para 13-76)
Remove handles (para 13-81)

13-86. CONTROL BOX REMOVAL AND DISASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using pliers, remove cotter pin (1) from rigid linkage (2) (JPG).
2.	Slide shaft (3) to side and remove rigid linkage (2) from rod end bearing (4).
3.	Using Allen wrench, remove setscrew (5) from shaft (3).
4.	Remove rod end bearing (4).
5.	Remove shaft (3) and two bearings (6) from box (7).
	NOTE Pellet (8) may remain in shaft (3).
6.	Using Allen wrench, put setscrew (5) in shaft (3) to remove pellet (8). Remove setscrew (5).
7.	Using hex head socket with speed handle, remove four screws (9), four lockwashers (10), and bushing (11) that attach control box (7) to housing (12).
8.	Remove control box (7) from housing (12).
	NOTE If stop pin (13) is to be removed, do step 9.
9.	Using hammer and punch, remove stop pin (13).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Inspect control box (para 13-85).
	END OF TASK



13-87. CONTROL BOX ASSEMBLY AND INSTALLATION PROCEDURE

TOOLS: 5/32" hex head socket (3/8" drive)
Needle nose pliers
1/8" socket head screw key (Allen wrench)
3/8" drive speed handle
5/32" socket head screw key (Allen wrench)
Plastic face hammer
6" machinist steel rule (two)

SUPPLIES: Cotter pin, MS 24665-132
Grease (item 12, App. A)
Lead pellet (10911146)

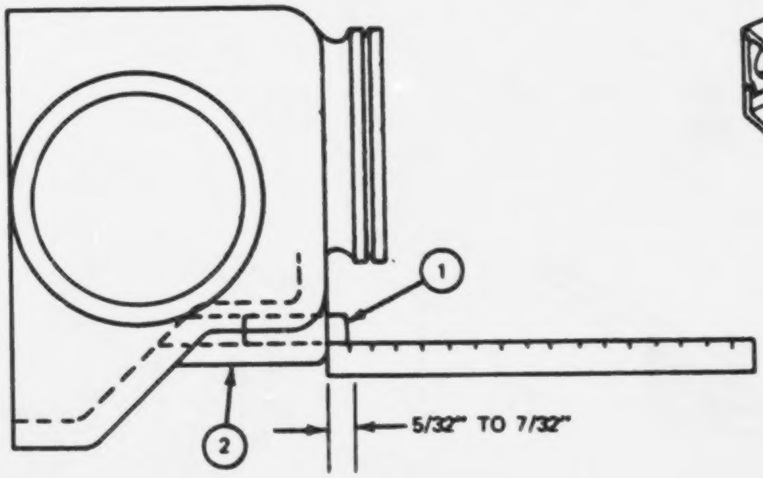
PERSONNEL: One

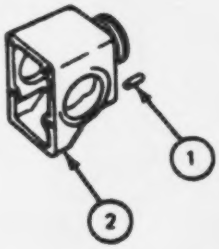
REFERENCES: JPG for procedures to:
Install cotter pins
Use machinist rule
Grease bearings

13-87. CONTROL BOX ASSEMBLY AND INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
	NOTE If stop pin (1) is installed in control box (2), go to frame 2. **NOTE** Stop pin (1) should stick out of control box (2) between 5/32" and 7/32".
1.	Using hammer, tap stop pin (1) in control box (2), while holding steel rule against control box (JPG). GO TO FRAME 2

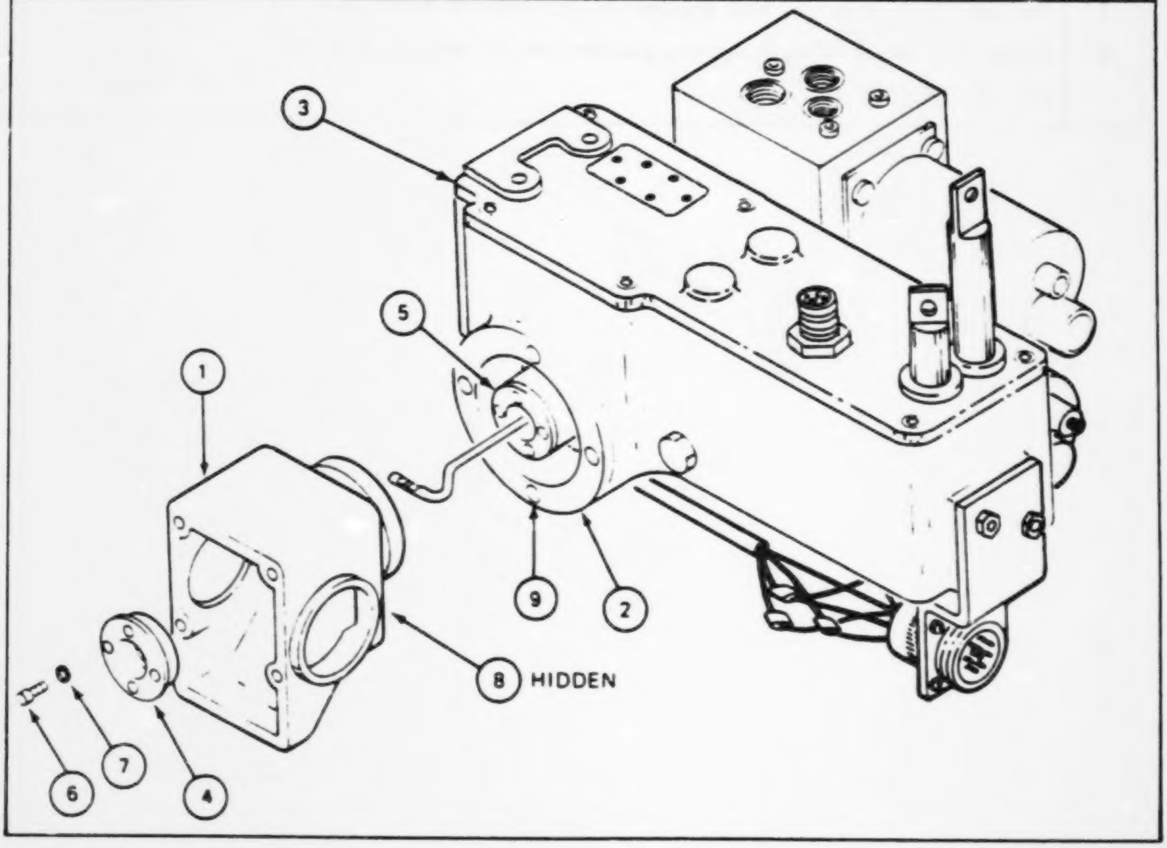




13-87. CONTROL BOX ASSEMBLY AND INSTALLATION PROCEDURE (CONT)

FRAME 2

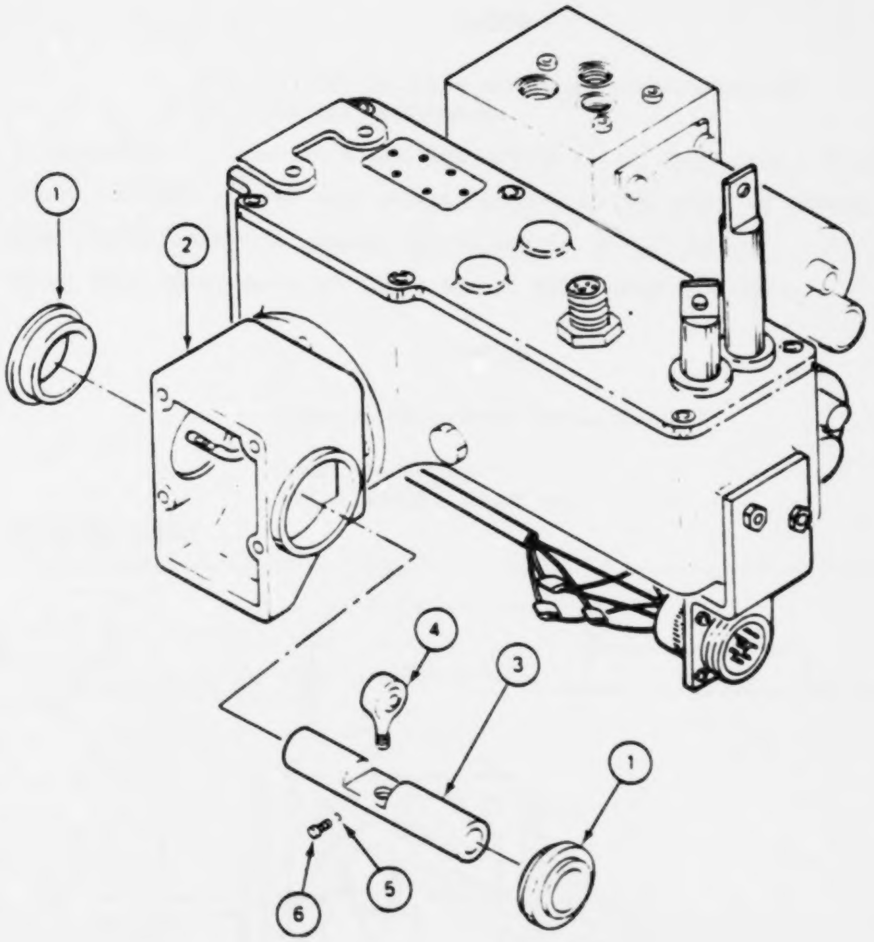
Step	Procedure
1.	Put flanged end of control box (1) inside cam bearing cover (2) on gunner's control (3). **NOTE** Small end of cam bushing (4) goes into gunner's control (3).
2.	Put cam bushing (4) inside control box (1) against cam (5). Line up screw holes.
3.	Using 5/32" Allen wrench, loosely attach cam bushing (4) to cam (5) with four screws (6) and four lockwashers (7).
4.	Line up stop pin (8) with bottom screw (9) of bearing cover (2).
5.	Using hex head socket with speed handle, tighten four screws (6). GO TO FRAME 3



13-87. CONTROL BOX ASSEMBLY AND INSTALLATION PROCEDURE (CONT)

FRAME 3

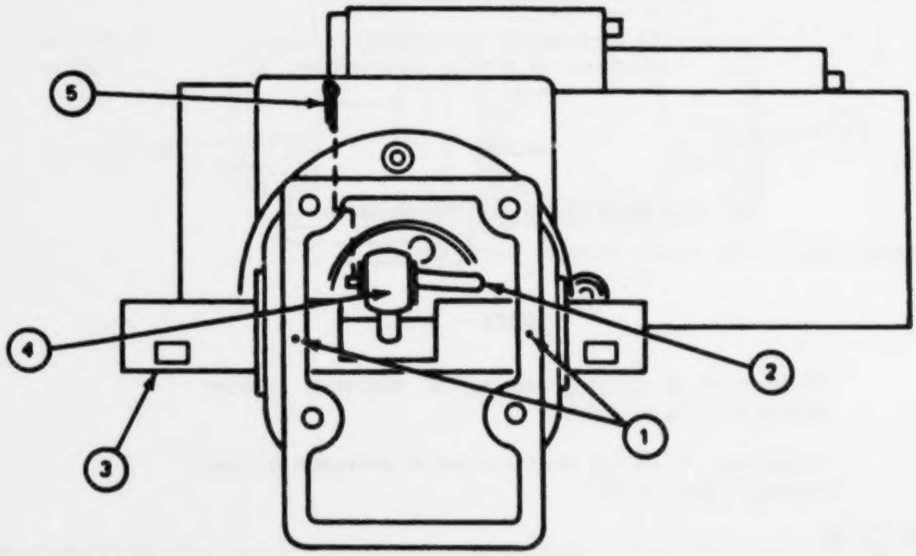
Step	Procedure
1.	Lubricate two bearings (1) (JPG).
2.	Using hands, put two bearings (1) in box (2).
	NOTE Do not put grease in cutout area at center of shaft (3).
3.	Apply thin coating of grease on shaft (3) where it will go through bearings.
4.	Put shaft (3) through two bearings (1).
5.	Using hands, put rod end (4) in shaft (3).
6.	Using steel rule, measure from flat portion of shaft (3) to bottom of rod end (4) bearing opening. Adjust height of rod end (4) on shaft (3) to between 15/32" and 17/32".
7.	Put new lead pellet (5) and setscrew (6) in hole of shaft (3).
8.	Using 1/8" Allen wrench, tighten setscrew (6) in hole of shaft (3).
	GO TO FRAME 4



13-87. CONTROL BOX ASSEMBLY AND INSTALLATION PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Put one ruler across cover mounting surface (1) and use second ruler to measure from small part of rigid linkage (2) to cover mounting surface (first ruler). Measurement should read between 1-1/32" and 1-1/16".
	NOTE Turn rigid linkage (2) in to increase measurement and out to decrease measurement.
2.	If measurement is incorrect, adjust rigid linkage (2) to obtain proper measurement.
3.	Check that shaft (3) and rigid linkage (2) have film of grease on rubbing areas.
4.	Slide shaft (3) sideways, putting rigid linkage (2) in rod end (4).
5.	Using pliers, install cotter pin (5) in end of rigid linkage (2) (JPG).
	NOTE **Follow-on Maintenance Action Required:** Install handles (para 13-82). Adjust gunner's control (para 13-73).
	END OF TASK



13-88. HOUSING AND HOUSING COVER INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Disassemble housing (para 13-93)

GENERAL INSTRUCTIONS:

NOTE

If part is bad, order repair part or next higher assembly as required.

FRAME 1

Step | **Procedure**

SUPPORT SHOP WORK

1. Take housing or cover to shop where inspection equipment is available.
2. Make dimensional check.

Reference Letter	Point of Measurement	Measurement
A	ID of cover counterbore	0.3750 to 0.3765
B	ID of cover counterbore	0.6865 to 0.6875
C	Diameter of cover counterbore	0.3120 to 0.3135
D	ID of housing bores	0.3750 to 0.3765
E	ID of housing counterbores	0.6865 to 0.6875
F	Diameter of housing counterbore	0.3120 to 0.3135

NOTE

Tag parts that are out of tolerance.

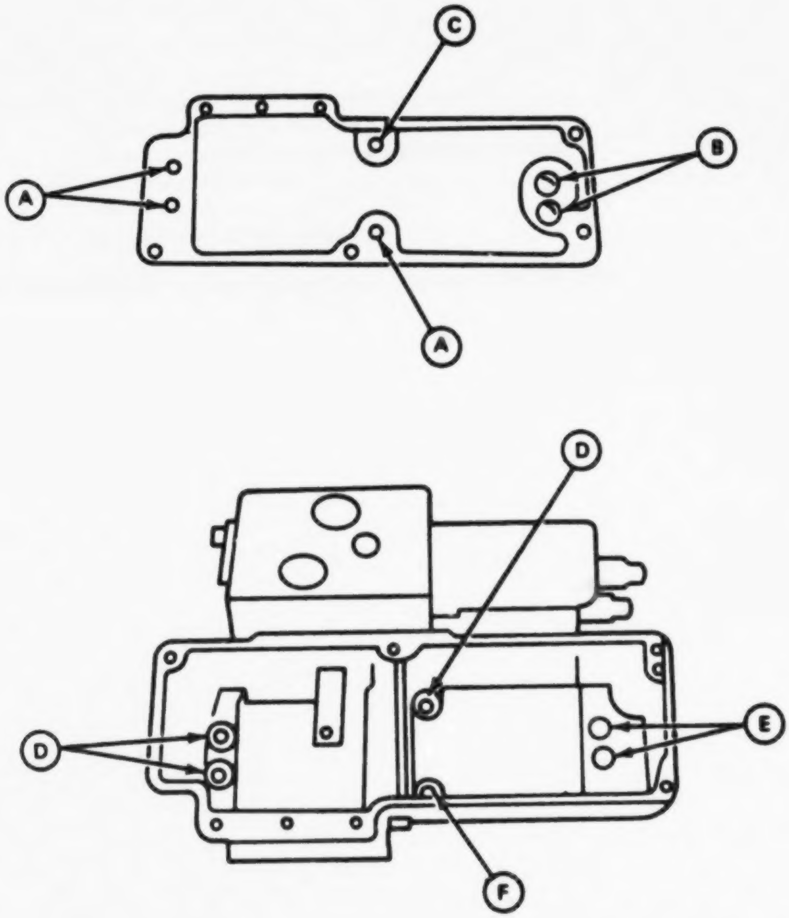
3. After support shop work, return parts to turret shop.

NOTE

If bearings in housing are out of tolerance, replace bearings (para 13-100).

If bearings in housing cover are out of tolerance, replace bearings (para 13-91).

END OF TASK



Para 13-88 Cont

13-89. HOUSING COVER REMOVAL PROCEDURE

TOOLS: 3/16'' socket head screw key (Allen wrench)
Plastic face hammer
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

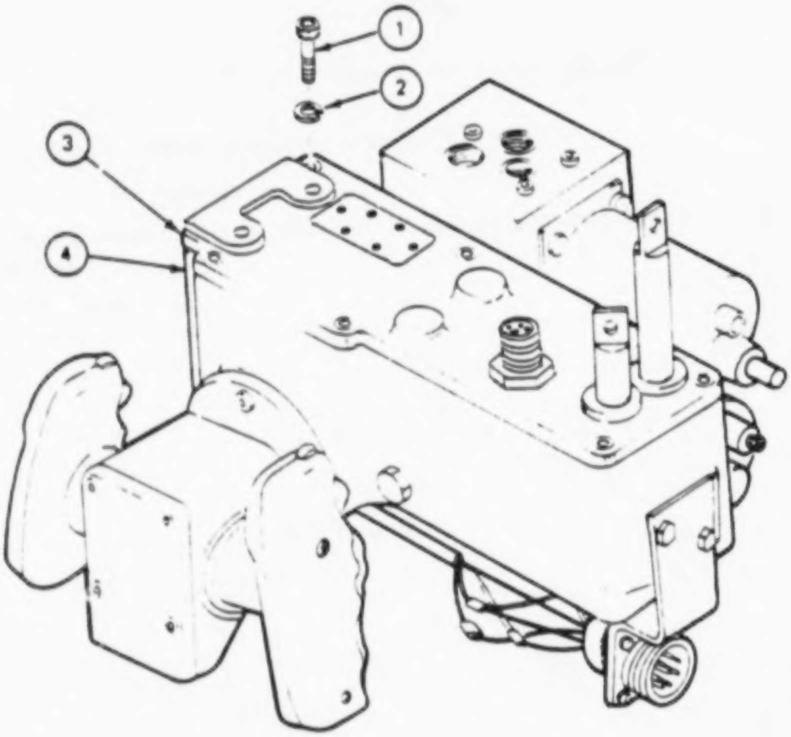
REFERENCES: TM 9-2350-257-20-2-3 for procedures to:
  Remove gunner's control
  Remove gunner's control adjustable resistor
JPG for procedures to:
  Clean parts
  Inspect and repair parts

EQUIPMENT CONDITION: Gunner's control removed (TM-20-2-3)

13-89. HOUSING COVER REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using Allen wrench, remove six screws (1) and six lockwashers (2) that attach cover (3) to housing (4). **NOTE** It may be necessary to use hammer to tap cover (3) loose from housing (4).
2.	Remove cover (3). **NOTE** Do step 3 only if cover (3) is bad.
3.	Remove gunner's control adjustable resistor (TM-20-2-3). **NOTE** **Follow-on Maintenance Action Required:** **Clean all parts (JPG).** **Inspect and repair all parts (JPG).** **Inspect housing cover (para 13-88).**
	END OF TASK



13-90. HOUSING COVER INSTALLATION PROCEDURE

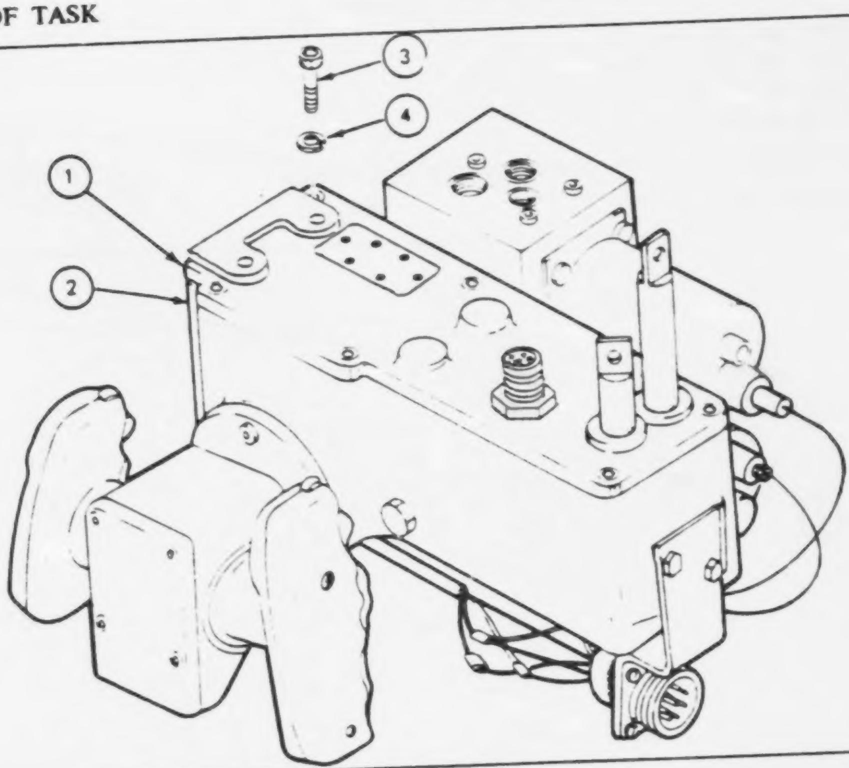
TOOLS: 3/16" socket head screw key (Allen wrench)

PERSONNEL: One

REFERENCES: TM 9-2350-257-20-2-3 for procedure to install gunner's control adjustable resistor

FRAME 1

Step	Procedure
	NOTE Do step 1 only if cover (1) was replaced.
1.	Install gunner's control adjustable resistor (TM-20-2-3).
2.	Put cover (1) on housing (2).
3.	Using Allen wrench, attach cover (1) to housing (2) with six screws (3) and six lockwashers (4).
	END OF TASK



13-91. HOUSING COVER REPAIR PROCEDURE

SUPPLIES: Pins 7974645 (two)
Bearings MS 17131-13 (two)

PERSONNEL: One

PRELIMINARY PROCEDURES: Inspect housing cover (para 13-88)

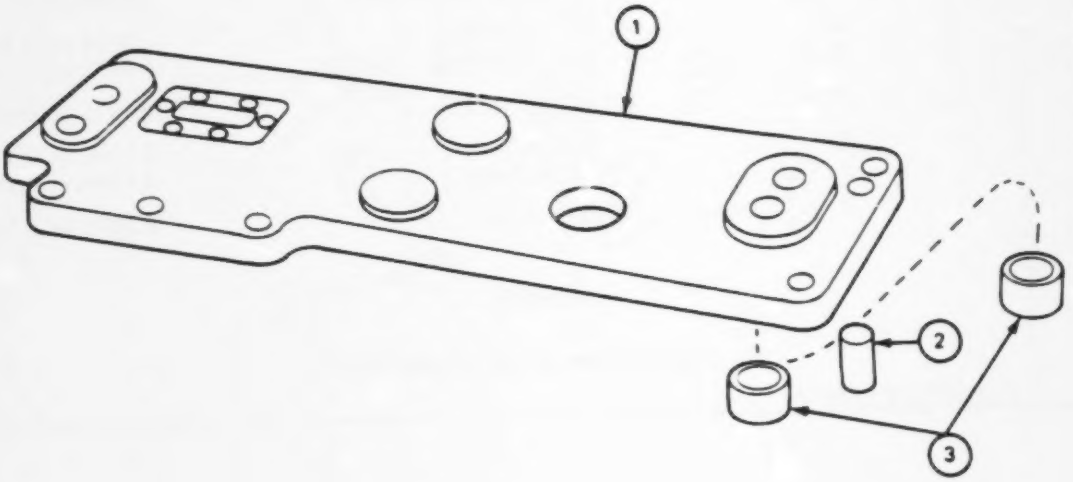
GENERAL INSTRUCTIONS:

NOTE

This procedure is used to replace bad pins and bearings in housing cover. If pins or bearings are bad, order repair part or next higher assembly.

FRAME 1

Step	Procedure
	SUPPORT SHOP WORK
1.	Take cover (1) to shop where press is available. a. Press out two pins (2). b. Press out two bearings (3). c. Press in two bearings (3). d. Press in two pins (2).
2.	After support shop work, return cover to turret shop.
	END OF TASK



13-92. TRAVERSING AND ELEVATING ARMS INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Remove traversing and elevating arms (para 13-93)

GENERAL INSTRUCTIONS:

NOTE

If part is bad, order repair part or next higher assembly as required.

FRAME 1

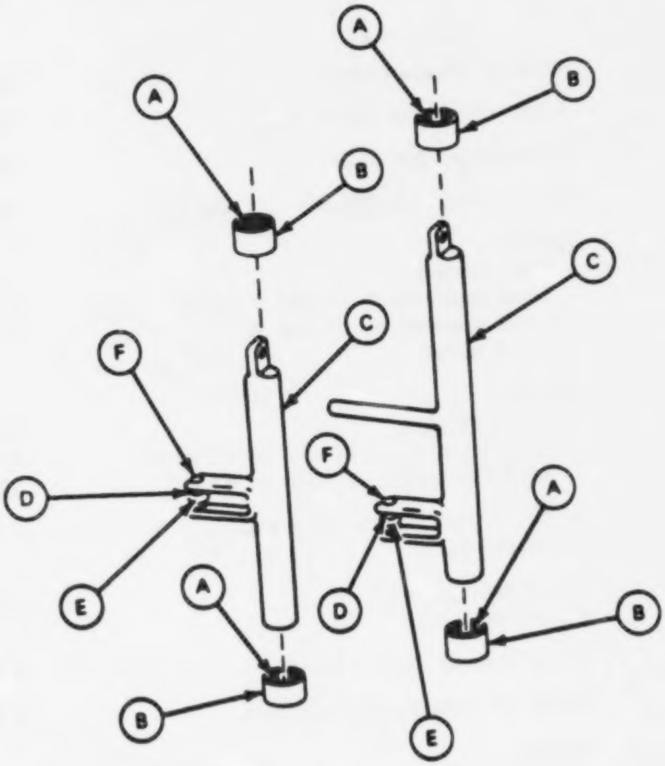
Step	Procedure
	SUPPORT SHOP WORK
1.	Take arms and linkage parts to shop where inspection equipment is available.
2.	Make dimensional check.

Reference Letter	Point of Measurement	Measurement
A	ID of bearing	0.5000 to 0.5005
B	OD of bearing	0.6870 to 0.6880
C	OD of shafts	0.4975 to 0.4990
D	OD of roller	0.3746 to 0.3750
E	ID of roller	0.1898 to 0.1905
F	OD of pin	0.1893 to 0.1898

NOTE

Tag parts that are out of tolerance.

GO TO FRAME 2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B
C
C
F
D
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F
A
A
B
D
E
B
B
E

13-92. TRAVERSING AND ELEVATING ARMS INSPECTION PROCEDURE (CONT)

FRAME 2

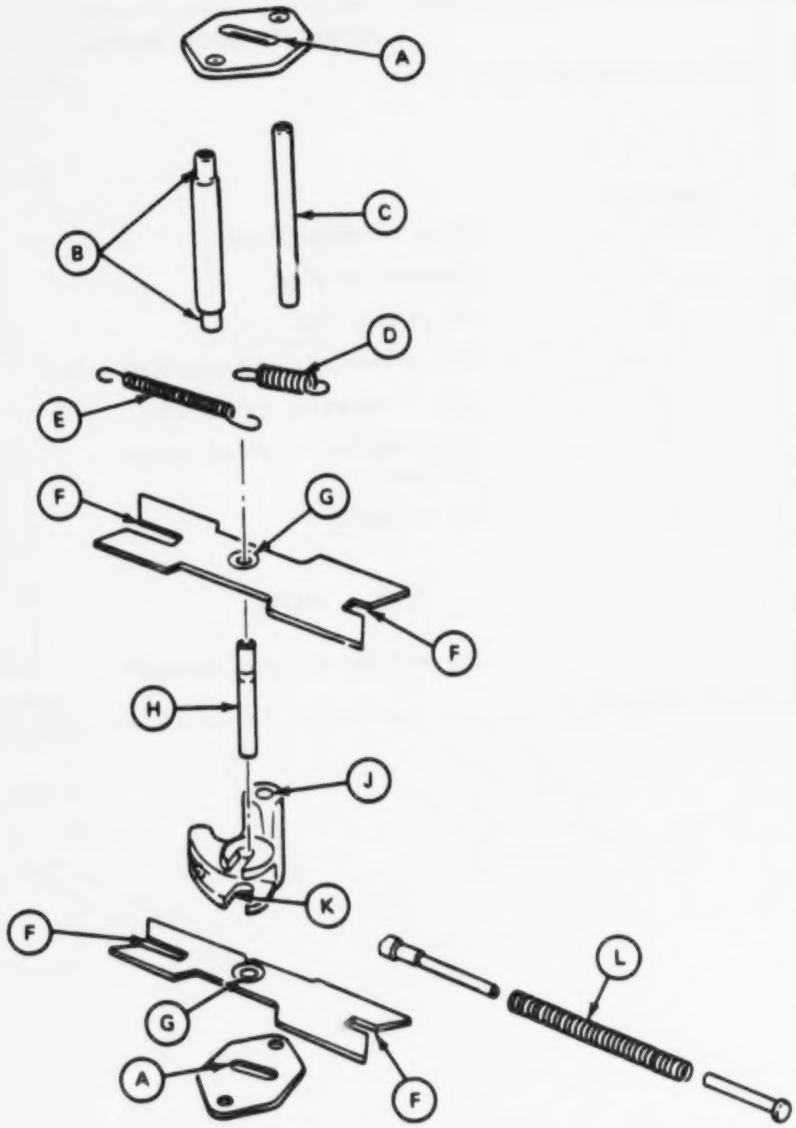
Step	Procedure
	SUPPORT SHOP WORK
1.	Make dimensional check.

Reference Letter	Point of Measurement	Measurement
A	Width of slot in blade plate	0.3760 to 0.3800
B	Diameter of pin ends	0.3105 to 0.3115
C	OD of blade plate pin	0.3750 to 0.3735
D	Spring:	
	Free Length	1-5/8 inches
	Load required to extend 2 inches	4.8 to 6.8 lb
	Load required to extend to 2-7/8 inches	11 to 13 lb
E	Spring:	
	Free Length	3.4800 to 3.5200
	Load required to extend to 4 inches	8 to 10 lb
	Load required to extend to 4.8750	23 to 25 lb
F	Width of slot in elevating and traversing blade	0.3750 to 0.3756
G	ID of hole in blade	0.3750 to 0.3760
H	OD of pin	0.3745 to 0.3750
J	ID of override arm bore	0.3750 to 0.3765
K	Width of slots in override arm	0.3760 to 0.3768
L	Spring:	
	Free Length	0.9170 to 0.9470
	Load required to compress to 4 inches	26.1 to 81.9 lb
	Load required to compress to 4.87 inches	18.45 to 22.55 lb

NOTE

Tag parts that are out of tolerance.

GO TO FRAME 3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F

13-92. TRAVERSING AND ELEVATING ARMS INSPECTION PROCEDURE (CONT)

FRAME 3

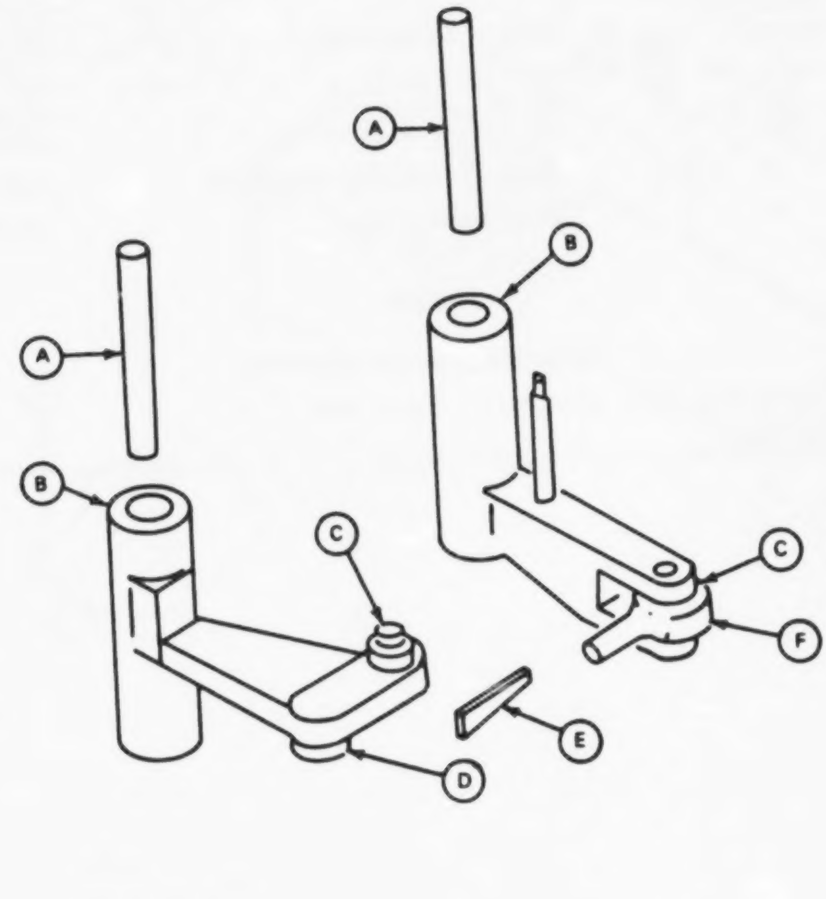
Step	Procedure
	SUPPORT SHOP WORK
1.	Make dimensional check.

Reference Letter	Point of Measurement	Measurement
A	Diameter of pins	0.3735 to 0.3745
B	ID of arm bore	0.3750 to 0.3765
C	OD of elevating and traversing rollers	0.3748 to 0.3750
D	OD of traversing arm bearing	0.6840 to 0.6870
E	Load required to deflect spring 1/8 inch	4 to 6 lb
F	ID of bearing	0.1895 to 0.1900

NOTE

Tag parts that are out of tolerance.

GO TO FRAME 4


A
A
B
B
C
C
D
E
F

13-92. TRAVERSING AND ELEVATING ARMS INSPECTION PROCEDURE (CONT)

FRAME 4

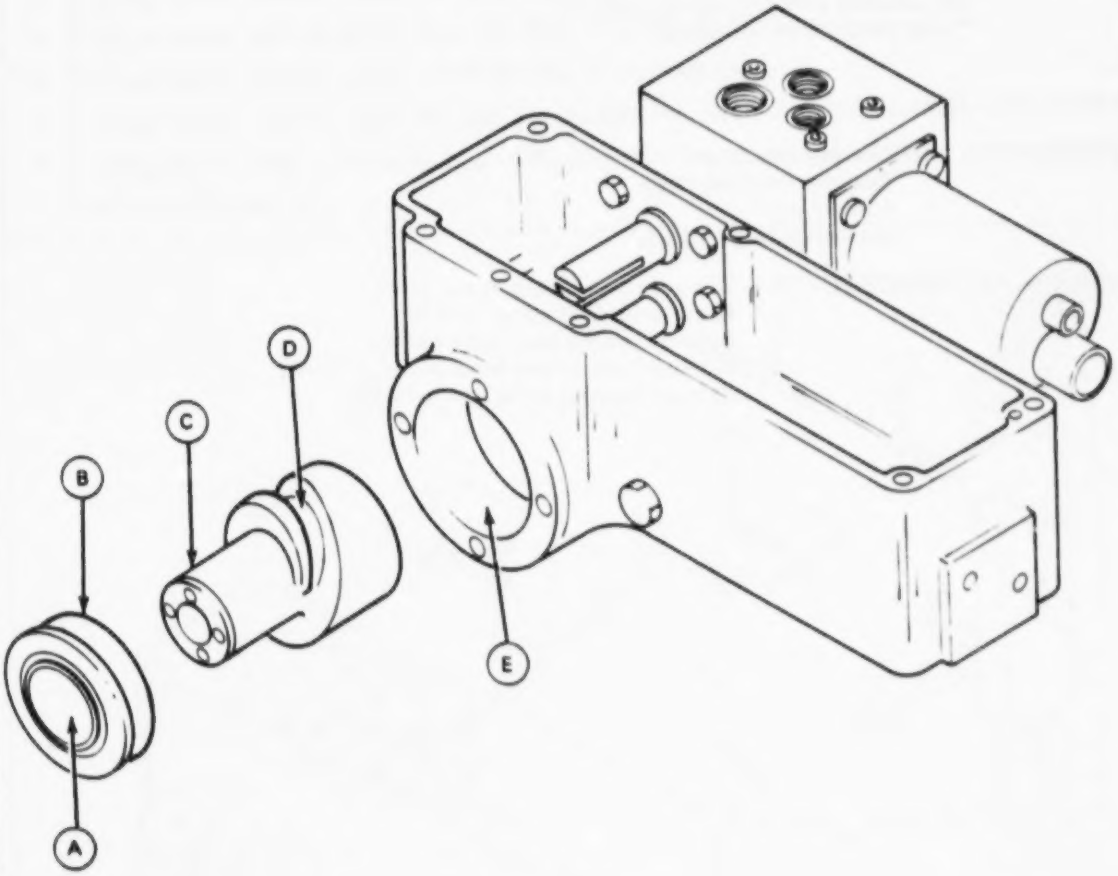
Step	Procedure
	SUPPORT SHOP WORK
1.	Make dimensional check.

Reference Letter	Point of Measurement	Measurement
A	ID of bearing	1.3775 to 1.3780
B	OD of bearing	2.8341 to 2.8346
C	OD of cam shank	1.3760 to 1.3775
D	Width of traversing cam groove	0.6872 to 0.6882
E	ID of housing bore	2.8350 to 2.8358

NOTE

Tag parts that are out of tolerance.

Step	Procedure
2.	After support shop work, return parts to turret shop.
	END OF TASK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C
B
E
A

13-93. TRAVERSING AND ELEVATING ARMS REMOVAL AND HOUSING DISASSEMBLY PROCEDURE

TOOLS:
- External retaining ring pliers
- 1/4" flat tip screwdriver
- 3/16" socket head screw key (Allen wrench)
- Scraper
- Stiff bristled brush
- Fine stone

SUPPLIES:
- Screw, 10-24 thread, 1-1/2" long
- #10 flat washer
- Dry cleaning solvent (item 33, App. A)
- Crocus cloth (item 7, App. A)

PERSONNEL: One

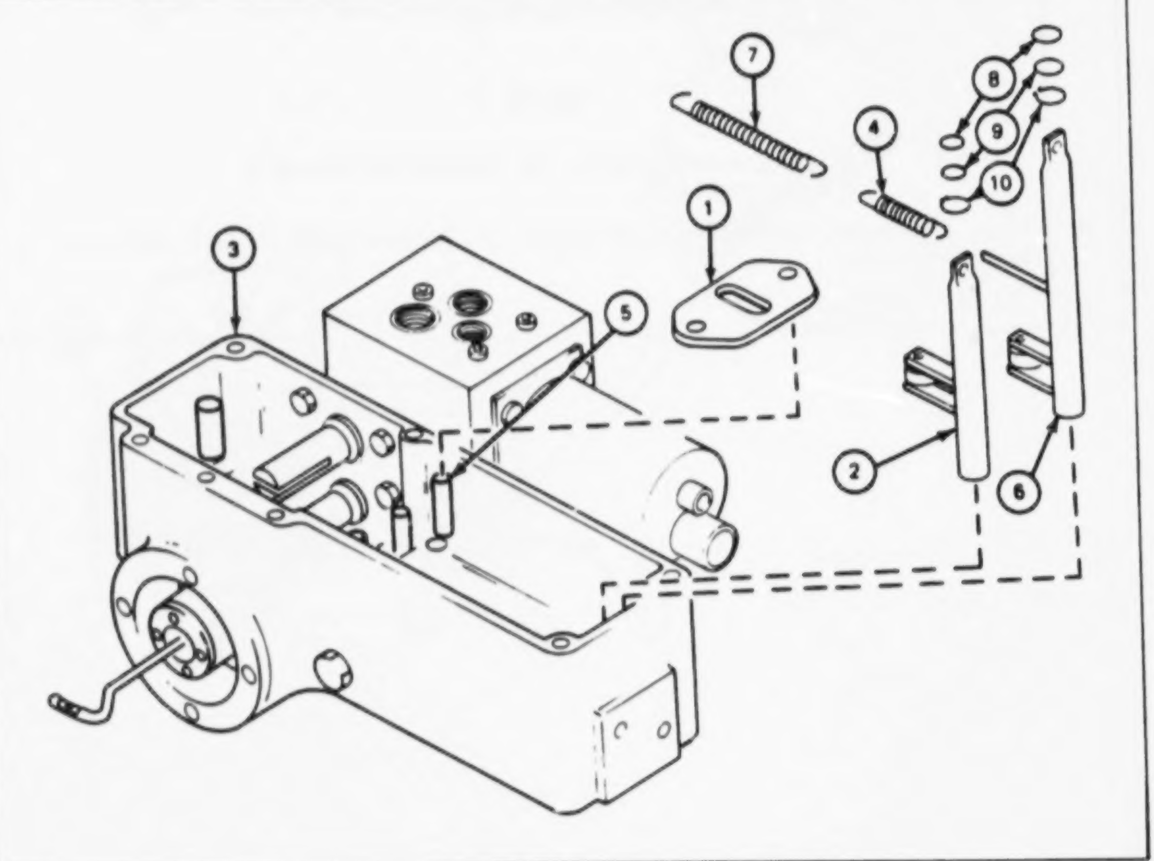
REFERENCES: JPG for procedures to:
- Remove retaining rings
- Clean parts
- Inspect and repair parts

PRELIMINARY PROCEDURES:
- Test gunner's control (para 13-72)
- Remove handles (para 13-81)
- Remove control box (para 13-86)
- Remove harness and bracket (para 13-78)
- Remove housing cover (para 13-89)

13-93. TRAVERSING AND ELEVATING ARMS REMOVAL AND HOUSING DISASSEMBLY PROCEDURE (CONT)

FRAME 1

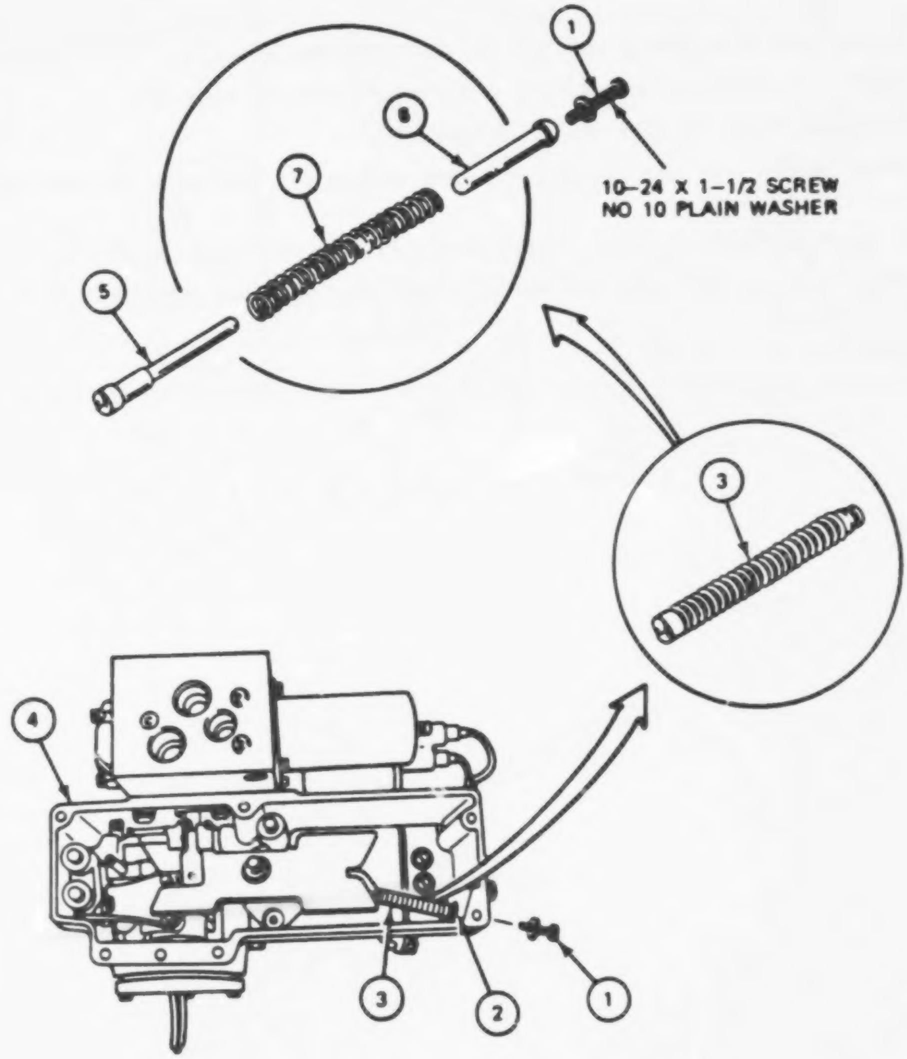
Step	Procedure
1.	Using hands, remove upper blade plate (1).
2.	Using hands, pull traverse shaft (2) from housing (3).
3.	Using hands, remove spring (4) from pin (5).
4.	Using hands, pull elevation shaft (6) from housing (3). Remove spring (4).
5.	Using hands, remove spring (7) from pins in housing (3).
6.	Using hands, remove shims (8) and flat washer (9) from shafts (2) and (6).
7.	Using pliers, remove retaining rings (10) from shafts (2) and (6) (JPG).
	GO TO FRAME 2



13-93. TRAVERSING AND ELEVATING ARMS REMOVAL AND HOUSING DISASSEMBLY PROCEDURE (CONT)

FRAME 2

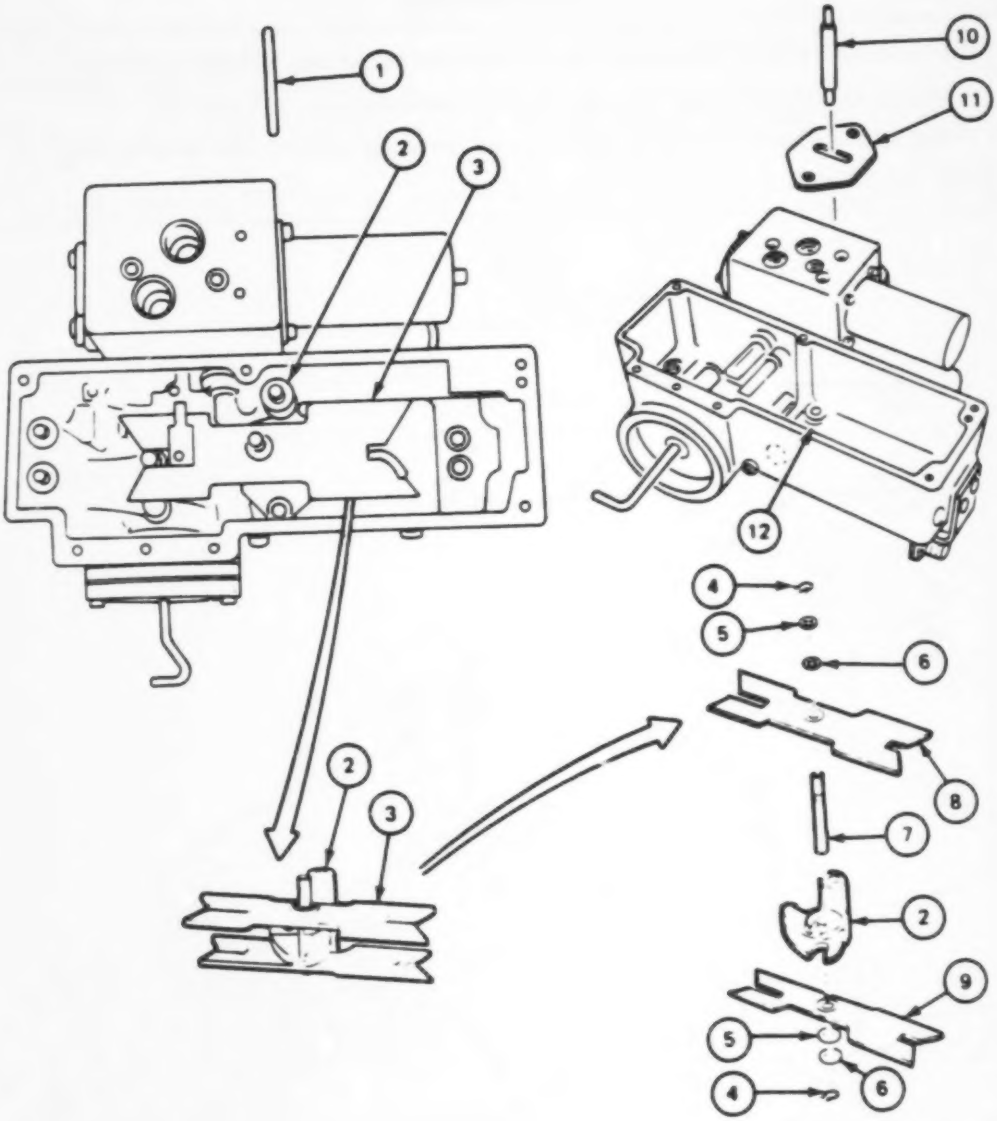
Step	Procedure
1.	Put screw with washer (1) through access hole (2) into spring assembly (3).
2.	Using screwdriver, tighten screw and washer (1) until spring assembly (3) is compressed and free of housing (4).
3.	Using hands, remove spring assembly (3) from housing (4). **WARNING** Spring (7) is compressed. Parts could fly out and hurt you if not held tightly when spring and washer (1) are removed. **NOTE** If spring assembly needs to be disassembled, do step 4; if not, go to frame 3.
4.	Using screwdriver, remove screw and washer (1). Remove guide (5) and retainer (6) from spring (7). GO TO FRAME 3


10-24 X 1-1/2 SCREW
NO 10 PLAIN WASHER

13-93. TRAVERSING AND ELEVATING ARMS REMOVAL AND HOUSING DISASSEMBLY PROCEDURE (CONT)

FRAME 3

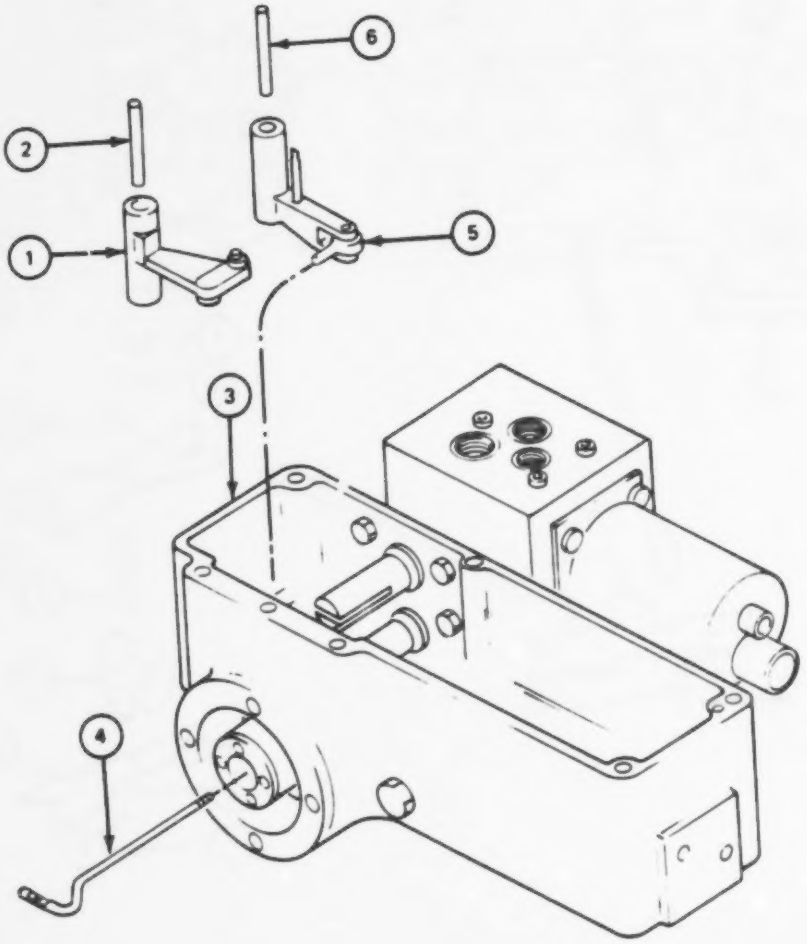
Step	Procedure
1.	Using hands, remove regulating plate pin (1) from override lever (2).
2.	Using hands, remove blade assembly (3) and override lever (2) as a unit.
3.	Remove override lever (2) from blade assembly (3).
4.	Using pliers, remove two retaining rings (4), two washers (5), and shims (6) from blade pin (7) (JPG).
5.	Remove traversing blade (8) and elevating blade (9) from blade pin (7).
6.	Using hands, remove regulating plate pin (10) and lower regulating plate (11) from housing (12).
	GO TO FRAME 4



13-93. TRAVERSING AND ELEVATING ARMS REMOVAL AND HOUSING DISASSEMBLY PROCEDURE (CONT)

FRAME 4

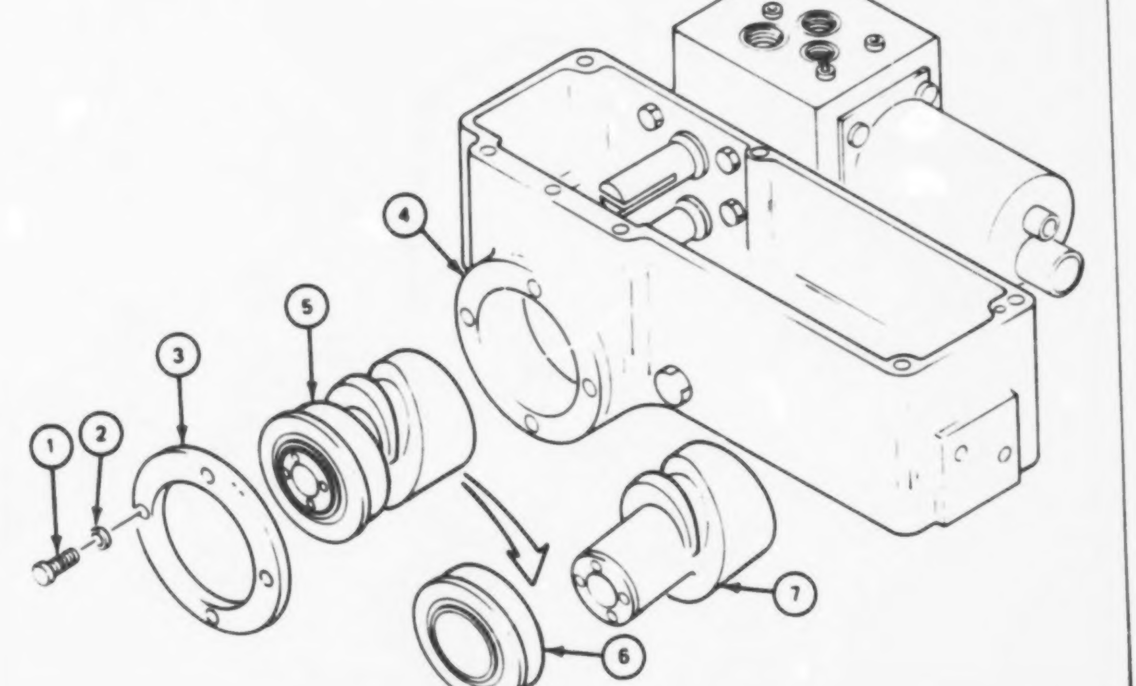
Step	Procedure
1.	Using hands, remove traversing arm (1) and traversing arm pin (2) from housing (3).
2.	Using hands, unscrew rigid linkage (4) from elevating arm assembly (5).
3.	Using hands, remove elevating arm (5) and elevating arm pin (6) from housing (3).
	GO TO FRAME 5



13-93. TRAVERSING AND ELEVATING ARMS REMOVAL AND HOUSING DISASSEMBLY PROCEDURE (CONT)

FRAME 5

Step	Procedure
1.	Using Allen wrench, remove four screws (1) and four lockwashers (2) that attach cam bearing cover (3) to housing (4).
2.	Using hands, remove cam bearing cover (3) and bearing cam assembly (5) from housing (4).
3.	Using hands, separate bearing (6) from cam (7).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Inspect traversing and elevating arms (para 13-92).
	END OF TASK



13-94. TRAVERSING AND ELEVATING ARMS INSTALLATION AND HOUSING ASSEMBLY PROCEDURE

TOOLS: Plastic face hammer
External retaining ring pliers
6" machinist steel rule
Feeler gauge, 0.0015" to 0.025"
1/4" flat tip screwdriver
3/16" socket head screw key (Allen wrench)

SUPPLIES: Screw, 10-24 thread, 1-1/2" long
#10 flat washer

PERSONNEL: One

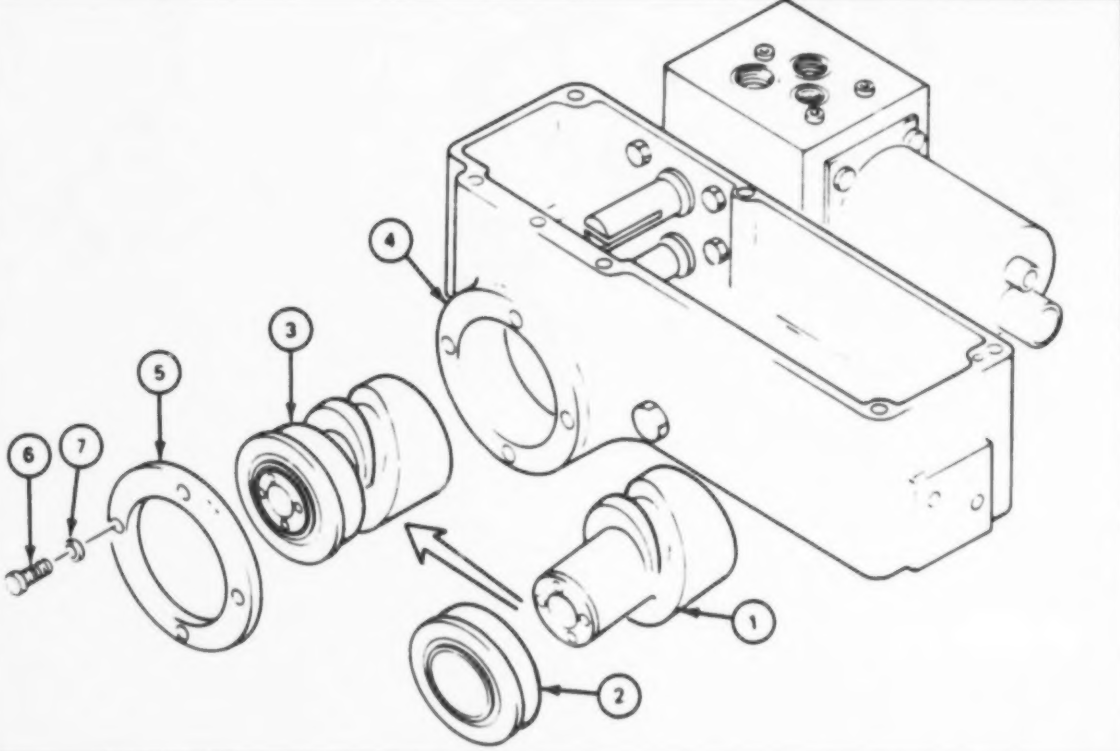
REFERENCES: JPG for procedures to:
Install retaining rings
Use feeler gauge

PRELIMINARY PROCEDURES: Assemble traversing arm (para 13-96)

13-94. TRAVERSING AND ELEVATING ARMS INSTALLATION AND HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 1

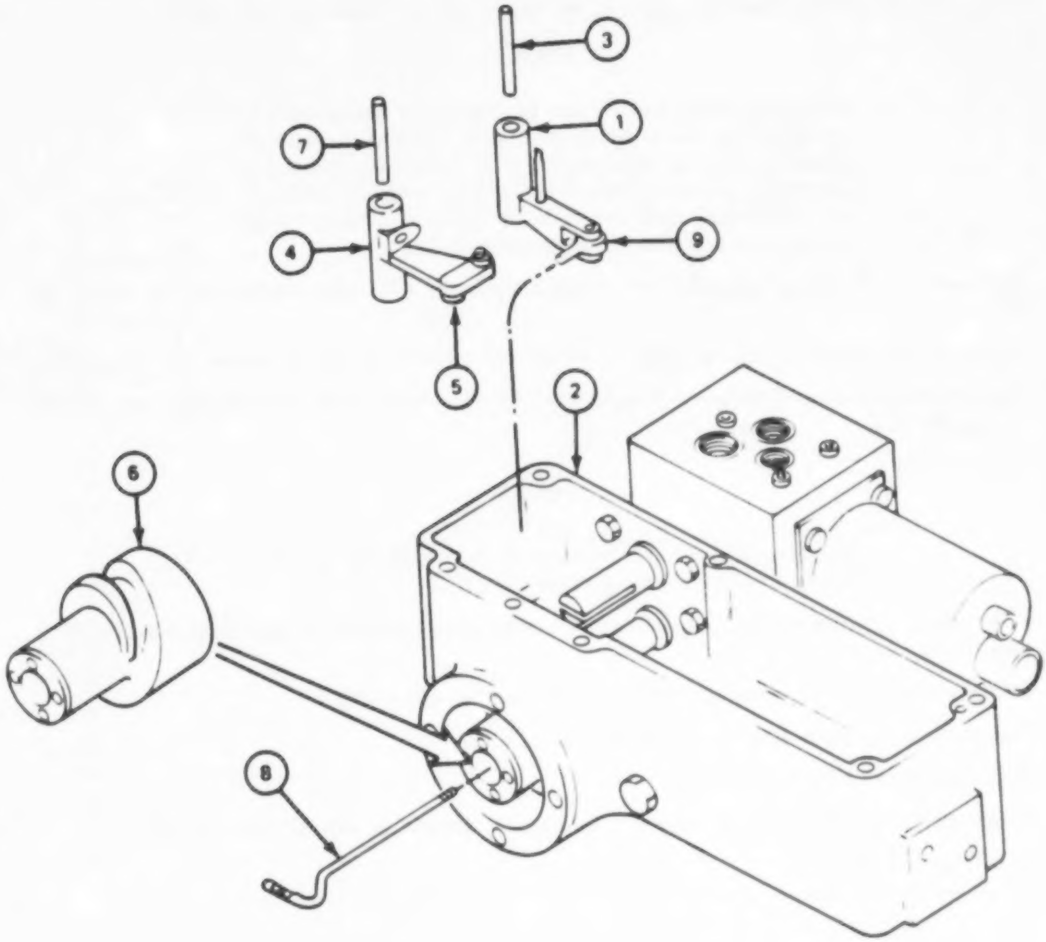
Step	Procedure
1.	Using hands, put cam (1) in bearing (2).
2.	Using fingers, push cam bearing assembly (3) in housing (4).
3.	Put cam bearing cover (5) over cam bearing assembly (3), with counterbored side of screw holes facing out. Line up all four screw holes with holes in housing (4).
	NOTE Two screws on sides will stick out farther than top and bottom screws. Side screws are traverse stop screws for box.
4.	Using 3/16" Allen wrench, install four screws (6) and four lockwashers (7) that attach cam bearing cover (5) to housing (4). GO TO FRAME 2



13-94. TRAVERSING AND ELEVATING ARMS INSTALLATION AND HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 2

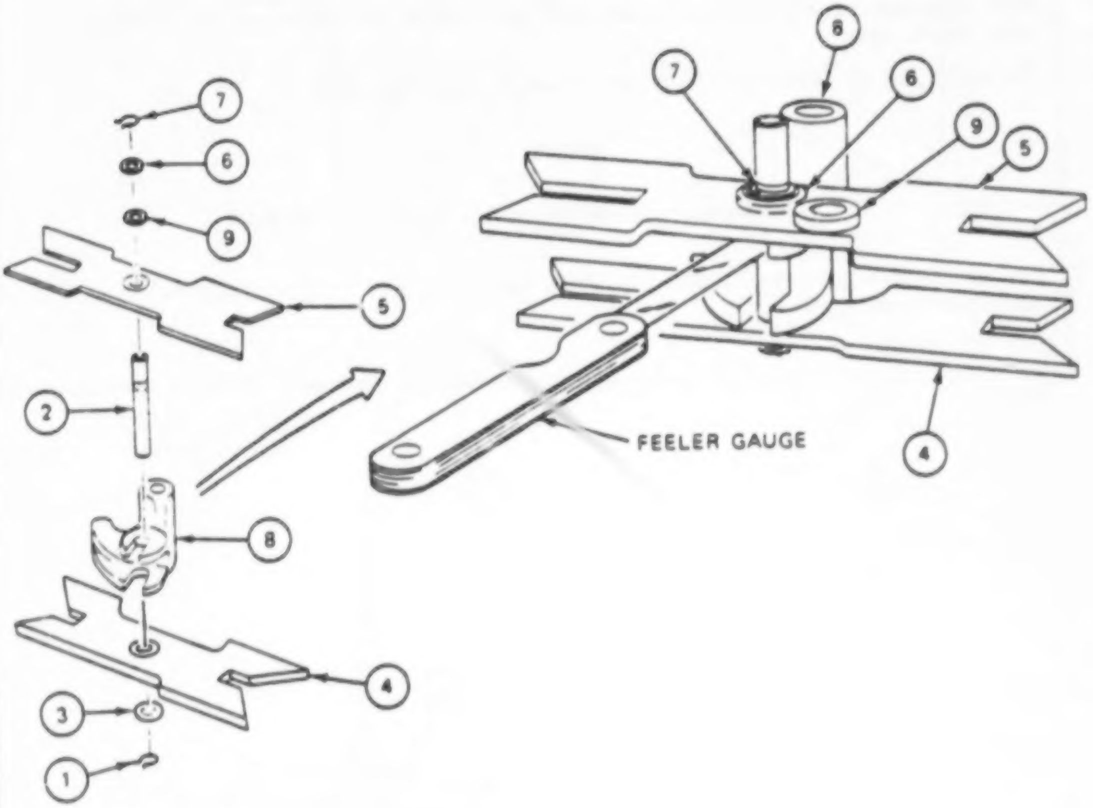
Step	Procedure
1.	Put elevating arm (1) in housing (2). Line up with elevating pin hole in housing.
2.	Put elevating arm pin (3) through elevating arm (1), and in elevating pin hole in housing (2). Tap pin gently with hammer if hole in housing is tight.
3.	Put traversing arm (4) in housing (2). Put cam roller (5) in slot of cam (6), lining up traversing arm with traversing arm pin hole in housing.
4.	Put traversing arm pin (7) through traversing arm (4) and in traversing pin hole in housing (2).
5.	Using hands, put rigid linkage (8) through hole in cam (6). Screw rigid linkage into rod end (9).
	GO TO FRAME 3



13-94. TRAVERSING AND ELEVATING ARMS INSTALLATION AND HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 3

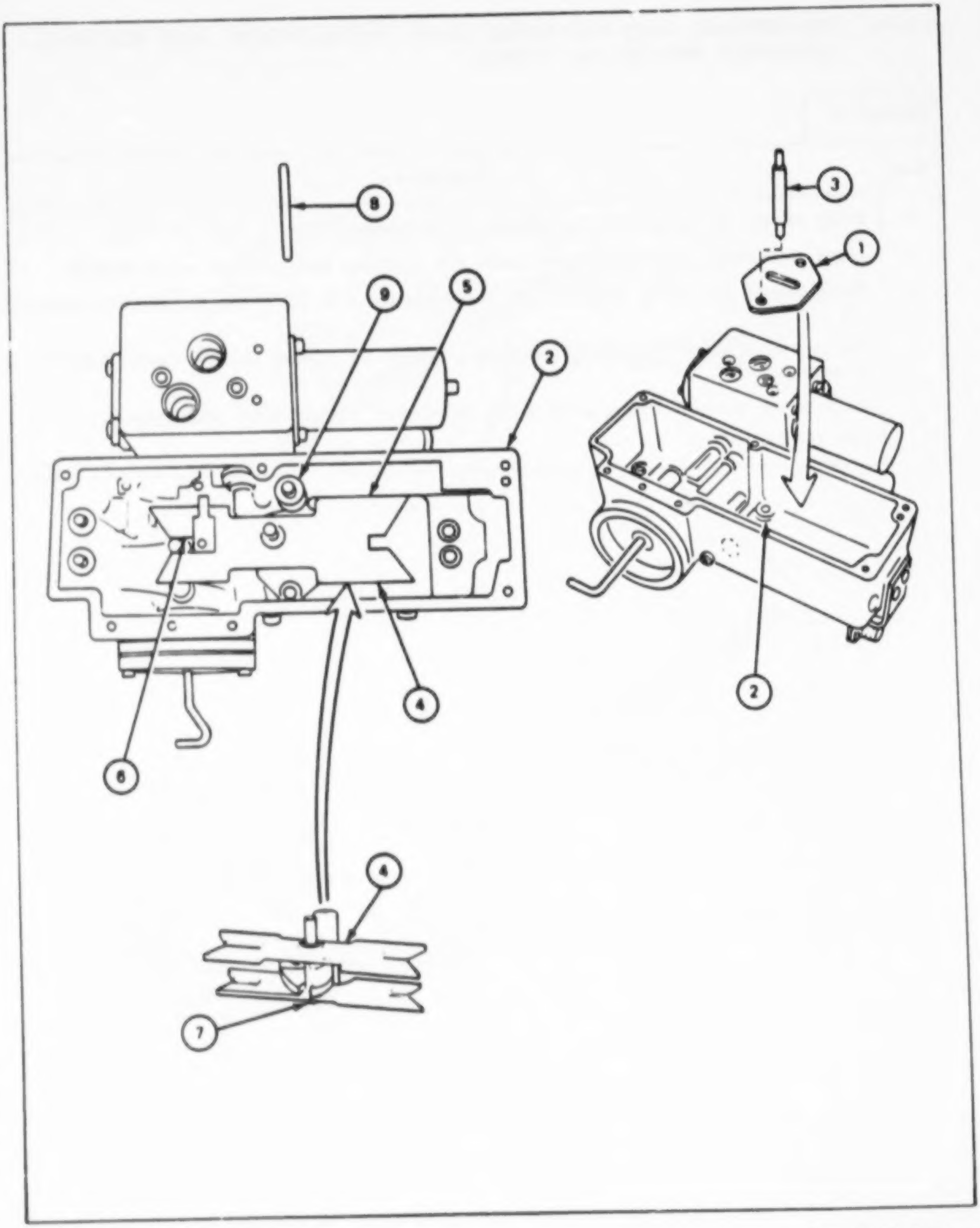
Step	Procedure
1.	Using pliers, install retaining ring (1) on lower end of blade pin (2) (JPG).
	NOTE Elevating blade (4) should be placed on blade pin (2) so that long slot of blade is to your left and pin hole in blade is close to edge nearest you. Traversing blade (5) should be placed on blade pin so that long slot of blade is to your left and pin hole in blade is close to edge away from you. Part numbers should face up.
2.	Put washer (3), elevating blade (4), traversing blade (5), and washer (6) on blade pin (2).
3.	Using pliers, install retaining ring (7) in narrow groove at top of blade pin (2) (JPG).
4.	Put override lever (8) between blades (4) and (5). Make sure slots in lever are around blade pin (2).
	NOTE Feeler gauge is used to measure gap between override lever (8) and traversing blade (5) (JPG).
5.	Slide shims (9) under edge of washer (6) until measurement of gap is between 0.001 and 0.008
6.	Using pliers, remove retaining ring (7) and washer (6) (JPG).
7.	Put shims (9) (from step 5) on blade pin (2).
8.	Put washer (6) on blade pin (2).
9.	Using pliers, install retaining ring (7) in narrow groove at top of pin (2) (JPG).
	GO TO FRAME 4


FEELER GAUGE

13-94. TRAVERSING AND ELEVATING ARMS INSTALLATION AND HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 4

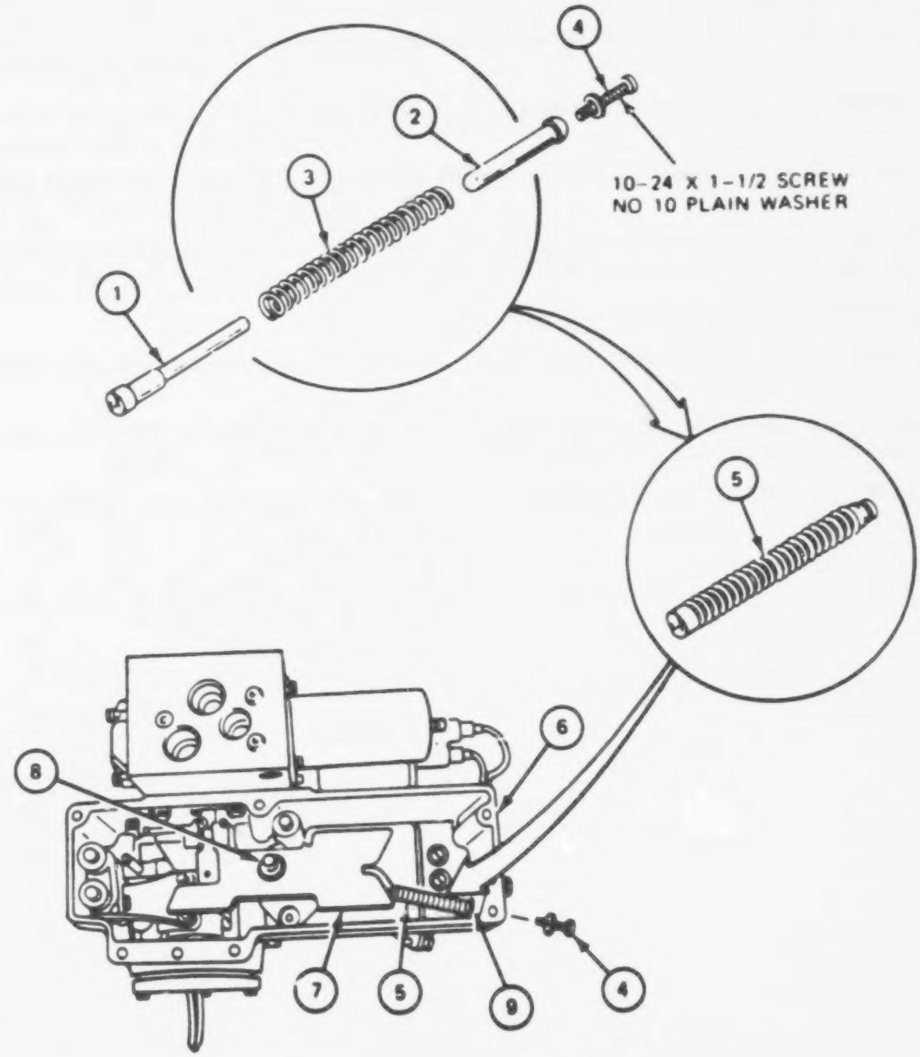
Step	Procedure
1.	Put lower regulating blade (1) in bottom of housing (2) with small hole to front. Line up pin holes and put in regulating plate pin (3).
2.	Put blade and override lever assembly (4) in housing (2).
3.	Slide long slots of two blades (5) into slots and around two rollers of two hydraulic valve spools (6).
4.	Put lower end of blade pin (7) in slot of lower regulating plate (1). **NOTE** It may be necessary to use plastic face hammer to put in pin (8).
5.	Put pin (8) through override arm (9), lower regulating plate (1), and into hole in bottom of housing (2). GO TO FRAME 5



13-94. TRAVERSING AND ELEVATING ARMS INSTALLATION AND HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 5

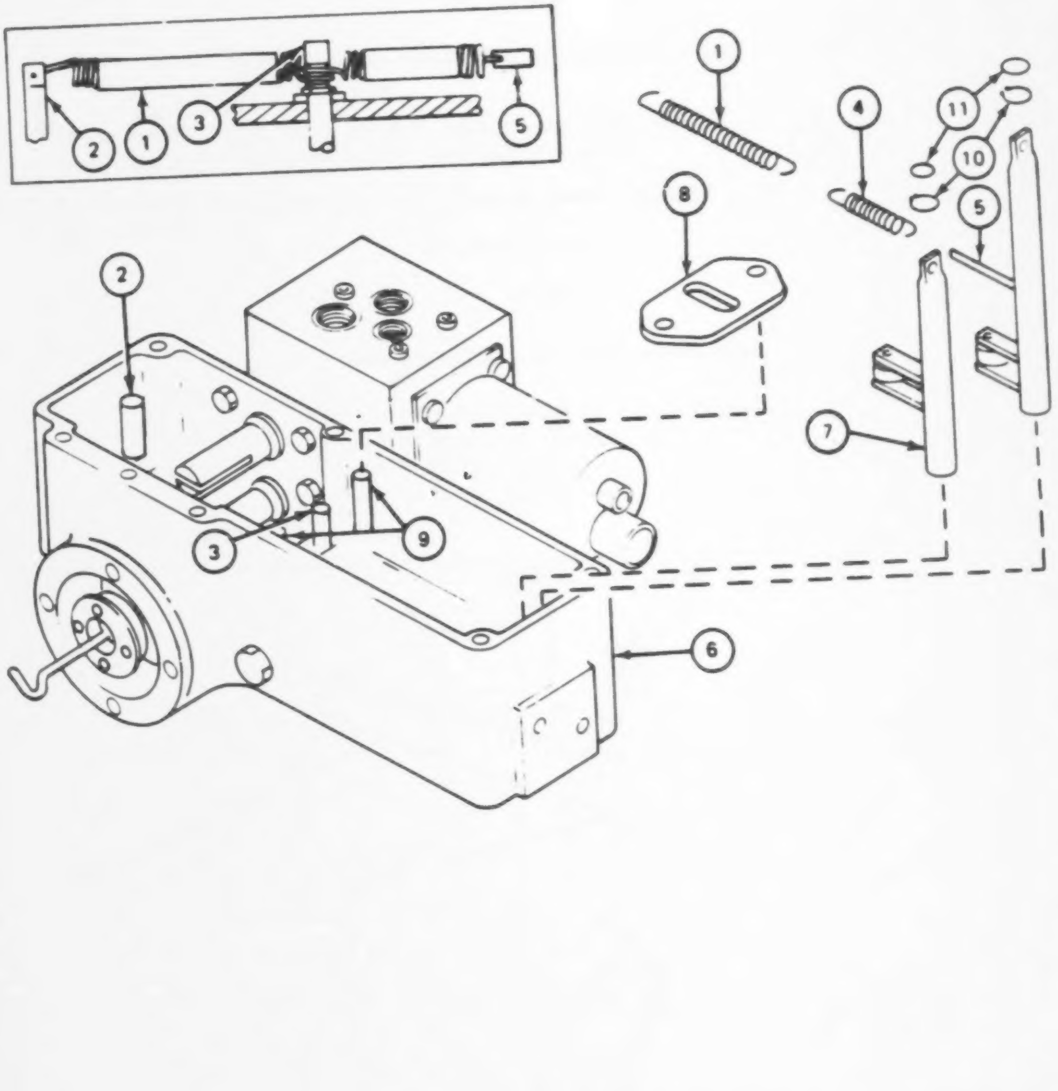
Step	Procedure
1.	Using fingers, put guide (1) and retainer (2) in spring (3).
2.	Using screwdriver, and washer with screw (4), compress spring (3) as far as possible.
3.	Using fingers, put spring assembly (5) in housing (6) with guide end between two blades (7).
4.	Put groove of guide (1) around blade pin (8). Line up retainer (2) with access hole (9) in housing (6).
5.	Hold spring assembly (5) in place. Using screwdriver, remove screw and washer (4).
	GO TO FRAME 6


10-24 X 1-1/2 SCREW
NO 10 PLAIN WASHER

13-94. TRAVERSING AND ELEVATING ARMS INSTALLATION AND HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 6

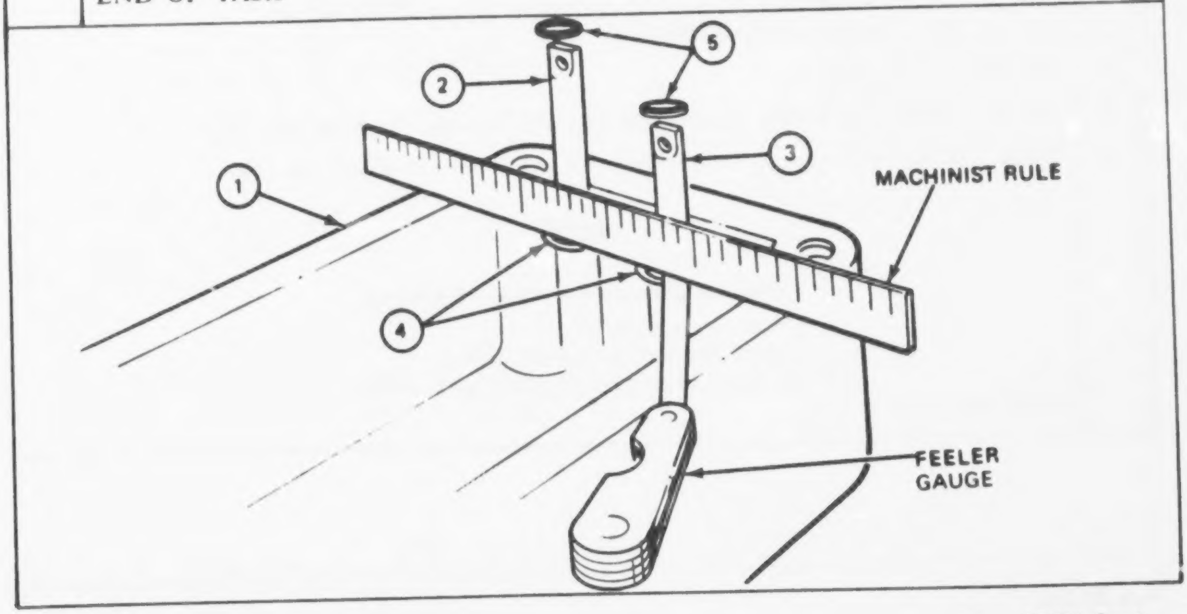
Step	Procedure
1.	Using hands, hook small loop end of spring (1) through hole in elevation arm spring pin (2).
2.	Using hands, hook large loop of spring (1) over blade pin (3) and seat loop in groove in blade pin (3).
3.	Using hands, hook small loop end of spring (4) through hole in spring pin of elevation shaft (5).
4.	Using hands, hook large loop of spring (4) over blade pin (3), seat loop in groove on blade pin (3), and put elevation shaft (5) in bearing in housing (6).
5.	Put traverse shaft (7) in bearing in housing (6).
6.	Using hands, put upper regulating plate (8) on two regulating plate pins (9) and blade pin (3).
7.	Using pliers, put one of two retaining rings (10) on groove of elevation shaft (5) and second one on traverse shaft (7) (JPG).
8.	Using hands, put one of two flat washers (11) on elevation shaft (5) and second one on traverse shaft (7).
	GO TO FRAME 7



13-94. TRAVERSING AND ELEVATING ARMS INSTALLATION AND HOUSING ASSEMBLY PROCEDURE (CONT)

FRAME 7

Step	Procedure
1.	Put machinist rule on edge across housing (1) and up against elevating shaft (2) and traversing shaft (3). **NOTE** Make sure elevating shaft (2) and traversing shaft (3) are fully seated.
2.	Using feeler gauge, measure gap between rule and washers (4) on shafts (2) and (3). Gap should be between 0.002" and 0.006" (JPG).
3.	Put shim on two shafts (2) and (3) until proper gap is measured between shim (5) and ruler (JPG). **NOTE** **Follow-on Maintenance Action Required:** Install gunner's control box (para 13-87). Install harness and bracket (para 13-79). Install housing cover (13-90). Install handles (para 13-82). END OF TASK



13-95. TRAVERSING ARM DISASSEMBLY PROCEDURE

TOOLS: 5/32" socket head screw key (Allen wrench)
3/16" drive pin punch
20 ounce ball peen hammer
Vise with brass caps
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

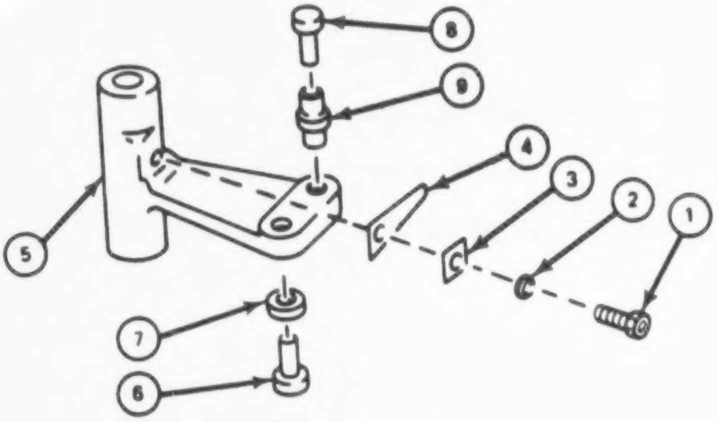
PERSONNEL: One

REFERENCES: JPG for procedures to:
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Remove traversing arm (para 13-93)

FRAME 1

Step	Procedure
1.	Using Allen wrench, remove screw (1), lockwasher (2), square washer (3), and spring (4) from arm (5).
	NOTE Roller pins (6) and (8) are staked in and should not be removed unless necessary.
2.	Put arm (5) in vise.
3.	Using hammer and punch, remove pin (6) and bearing (7) from arm (5).
4.	Using hammer and punch, remove pin (8) and roller (9) from arm (5).
	NOTE **Follow-on Maintenance Action Required:** Clean all parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of parts (para 13-92).
	END OF TASK



13-96. TRAVERSING ARM ASSEMBLY PROCEDURE

TOOLS: 5/32" socket head screw key (Allen wrench)
20 ounce ball peen hammer
Center punch

SUPPLIES: Grease (item 12, App. A)
Spring roller, blade (7973627)
Pin, blade roller (7973806)
Roller, cam (7973875)
Pin, cam roller (7973810)

PERSONNEL: One

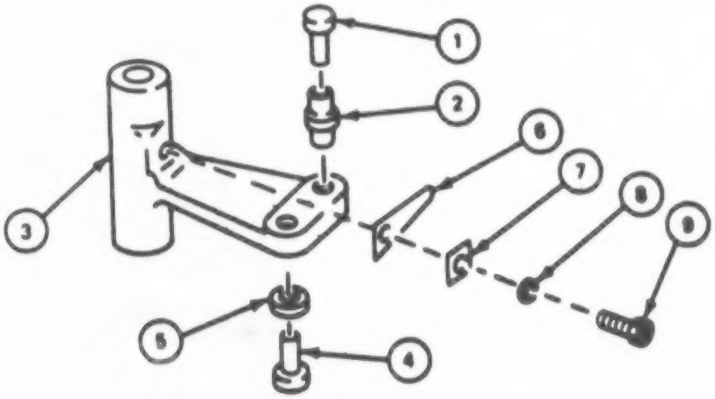
REFERENCES: JPG for procedures to:
Lubricate parts
Stake pins

PRELIMINARY PROCEDURES: Inspect traversing arm (para 13-92)

13-96. TRAVERSING ARM ASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Lubricate moving parts (JPG).
	NOTE Pins (1) and (4) must be loose enough to let rollers move freely.
2.	Using hammer, drive in new blade roller pin (1) through roller (2) and arm (3).
3.	Using hammer, drive in new cam roller pin (4) through roller (5) and arm (3).
4.	Using hammer and punch, stake pins (1) and (4) (JPG).
5.	Using Allen wrench, put spring (6), square washer (7), lockwasher (8), and screw (9) on arm (3).
	NOTE Follow-on Maintenance Action Required: Install traversing arm (para 13-94).
	END OF TASK



13-97. ELEVATING ARM REPAIR PROCEDURE

TOOLS: 7/16" combination wrench (two)
6" machinist steel rule

SUPPLIES: Roller 7973627
Pin 7974223
Rod end 712015
Pin 7973811

PERSONNEL: One

PRELIMINARY PROCEDURES: Inspect elevating arm (para 13-92)

GENERAL INSTRUCTIONS:

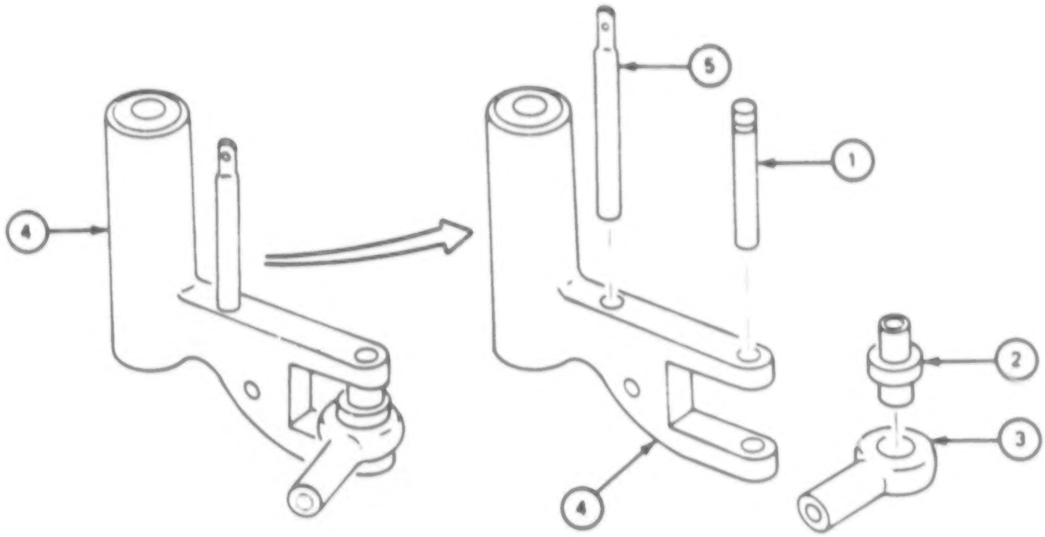
NOTE

This procedure is used to replace bad stop screw, roller pin, rod end, and spring attach pin in elevating arm. If parts are bad, order repair parts or next higher assembly as required.

13-97. ELEVATING ARM REPAIR PROCEDURE (CONT)

FRAME 1

Step	Procedure
	SUPPORT SHOP WORK
1.	Take elevating arm (4) to shop where press is available. a. Press out roller pin (1). Remove roller (2) and rod end (3) from elevating arm (4). b. Press out spring attach pin (5). c. Press in new spring attach pin (5). d. Put new roller (2) and new rod end (3) on elevating arm (4). Press in new roller pin (1).
2.	After support shop work, return parts to turret shop. GO TO FRAME 2

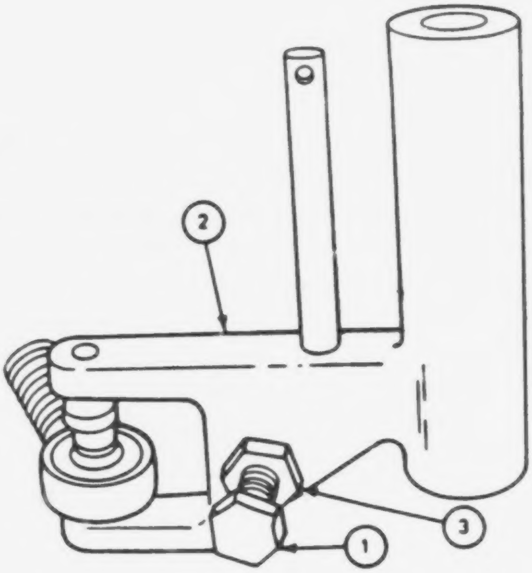


Para 13-97 Cont

13-97. ELEVATING ARM REPAIR PROCEDURE (CONT)

FRAME 2

Step	Procedure
	NOTE Do this frame to replace stopscrew (1).
1.	Using rule, measure distance from end of stopscrew (1) to face of elevating arm (2).
2.	Using wrench, loosen jamnut (3) on stopscrew (1).
3.	Using wrench, remove stopscrew (1) from elevating arm (2).
4.	Using hands and rule, put new jamnut (3) on new stopscrew (1).
5.	Using hands, put stopscrew (1) in elevating arm (2).
6.	Using wrench and rule, adjust stopscrew (1) to obtain measurement of step 1.
7.	Using two wrenches, tighten jamnut (3) while holding stopscrew (1).
	END OF TASK



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13-98. HOUSING OR HYDRAULIC VALVE REMOVAL PROCEDURE

TOOLS: 7/64" socket head screw key (Allen wrench)
1/2" combination wrench
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

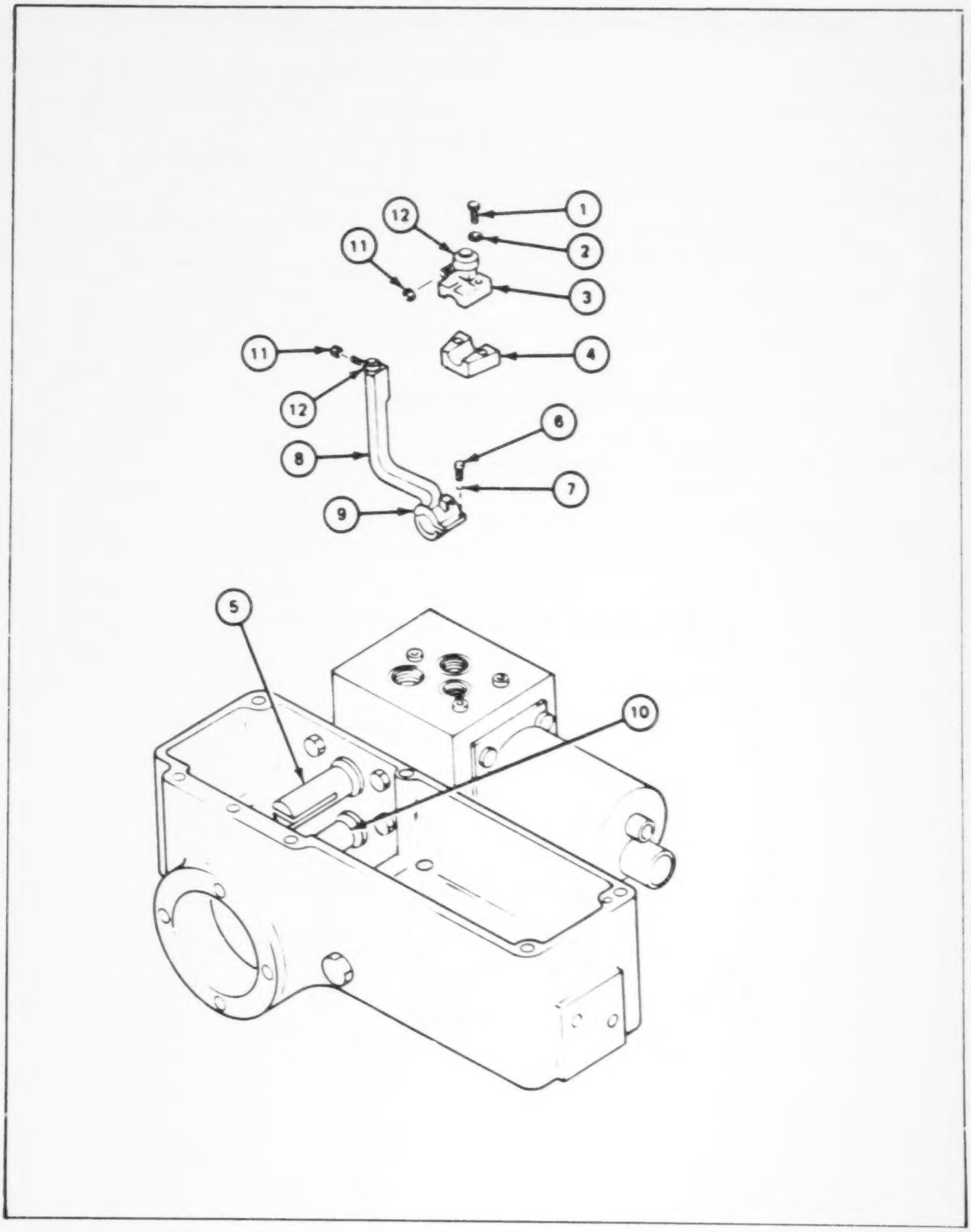
PERSONNEL: One

REFERENCES: JPG for procedures to:
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Test gunner's control (para 13-72)
Remove control box cover (para 13-76)
Remove gunner's control handles (para 13-81)
Remove gunner's control box (para 13-86)
Remove harness (para 13-78)
Remove housing cover (para 13-89)
Remove elevating arm and traversing arm (para 13-93)

FRAME 1

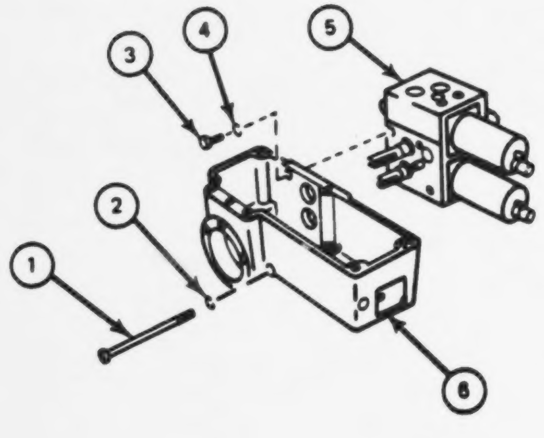
Step	Procedure
1.	Using Allen wrench, remove two screws (1) and two lockwashers (2) that attach clamp (3) and block (4) to traversing spool (5). Remove clamp and block.
2.	Using Allen wrench, remove two screws (6) and two lockwashers (7) that attach support (8) and block (9) to spool (10). Remove support and block.
3.	Using hands, remove two locknuts (11) from two rod ends (12). GO TO FRAME 2



13-98. HOUSING OR HYDRAULIC VALVE REMOVAL PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Using combination wrench, remove screw (1) and lockwasher (2).
2.	Using combination wrench, remove two screws (3) and two lockwashers (4) that attach hydraulic valve (5) to housing (6).
3.	Using hand, remove hydraulic valve (5) from housing (6).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Inspect housing (para 13-88).
	END OF TASK



13-99. HOUSING OR HYDRAULIC VALVE INSTALLATION PROCEDURE

TOOLS: 7/64" socket head screw key (Allen wrench)
1/2" combination wrench

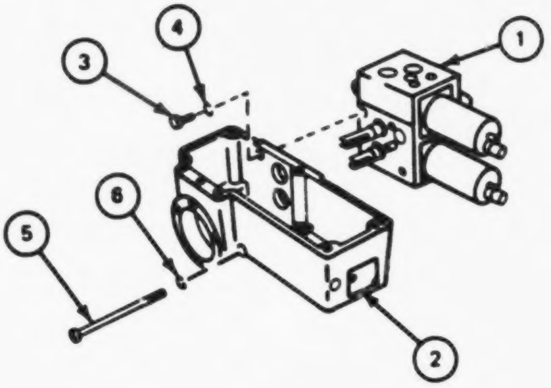
SUPPLIES: Sealing compound (item 27, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Use sealing compound
Use torque wrench

FRAME 1

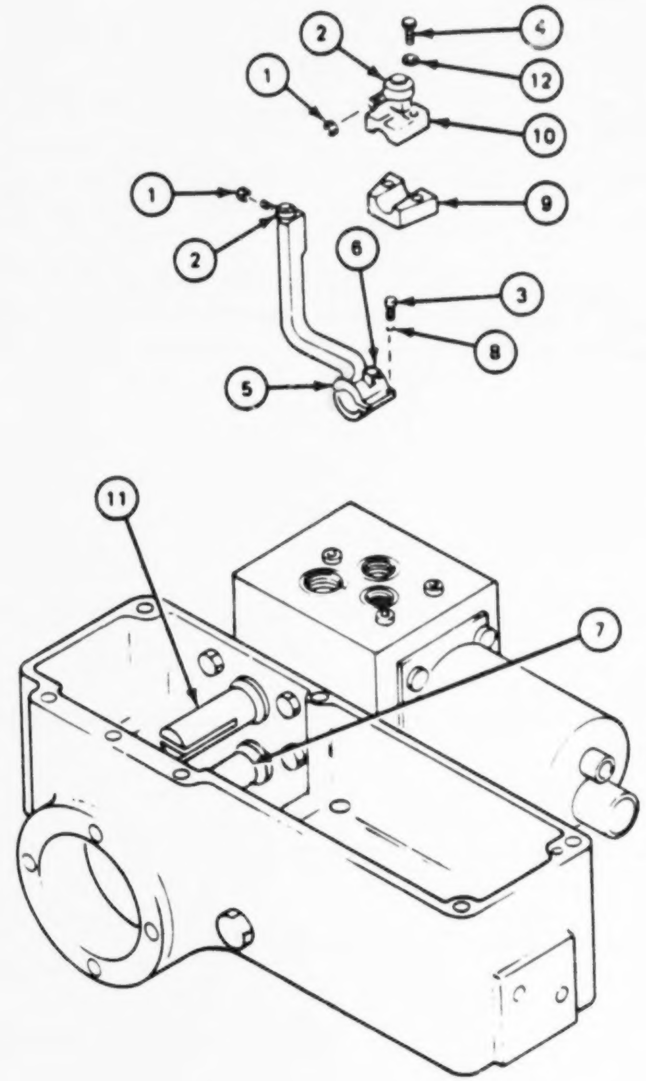
Step	Procedures
1.	Put hydraulic valve (1) against housing (2). Line up attaching screw holes.
2.	Using hands, put in two screws (3) and two lockwashers (4) that attach hydraulic valve (1) to housing (2). Do not tighten screws.
3.	Using hands, put in screw (5) and lockwasher (6).
4.	Using combination wrench, tighten two screws (3) and screw (5). GO TO FRAME 2



13-99. HOUSING OR HYDRAULIC VALVE INSTALLATION PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Using hands, put two locknuts (1) on two rod ends (2).
	NOTE Screws (3) and (4) are installed and tightened before sealing compound sets.
2.	Apply sealing compound to two screws (3) and two screws (4) (JPG).
	NOTE Slot between block (5) and support (6), and slot between block (9) and clamp (10) are aligned with slots in spools (7) and (11), respectively.
3.	Using Allen wrench, attach block (5) and support (6) against shoulder of spool (7) with two screws (3) and two lockwashers (8).
4.	Using Allen wrench, attach block (9) and clamp (10) against shoulder of spool (11) with two screws (4) and two lockwashers (12).
	NOTE Follow-on Maintenance Action Required: Install elevating arm and traversing arm (para 13-94). Install housing cover (para 13-90). Assemble and install control box (para 13-87). Install handles (para 13-82). Install harness and bracket (para 13-79). Install control box cover (para 13-77). Test gunner's control (para 13-72).
	END OF TASK



13-100. HOUSING REPAIR PROCEDURE

SUPPLIES: Bearing MS 17131-13 (two)
Disk 7974643 (two)
Pins 11610847 (two)
Rod ends 11637334 (two)

PERSONNEL: One

PRELIMINARY PROCEDURES: Inspect housing (para 13-88)

GENERAL INSTRUCTIONS:

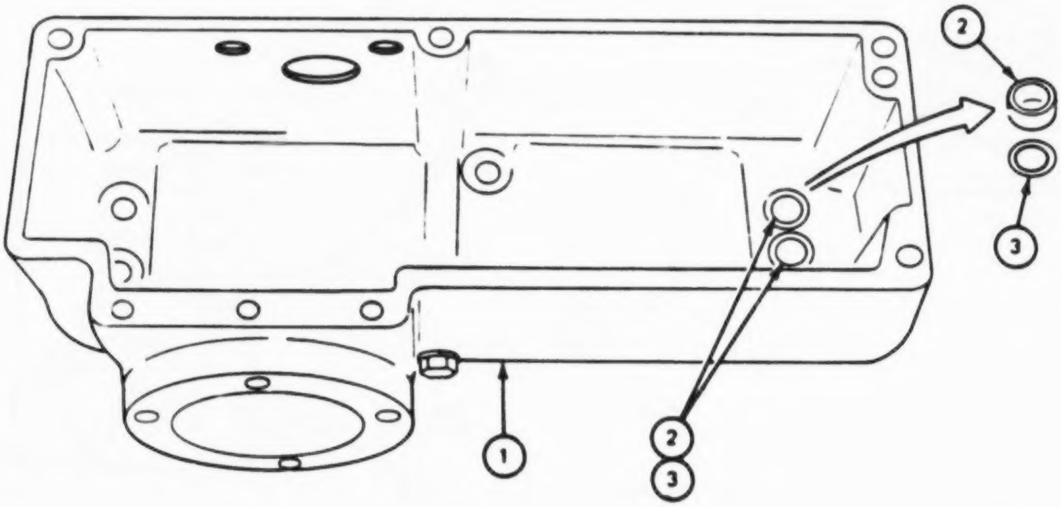
NOTE

This procedure is used to replace bad bearings and supports in housing. If bearings or supports are bad, order repair parts or next higher assembly.

13-100. HOUSING REPAIR PROCEDURE (CONT)

FRAME 1

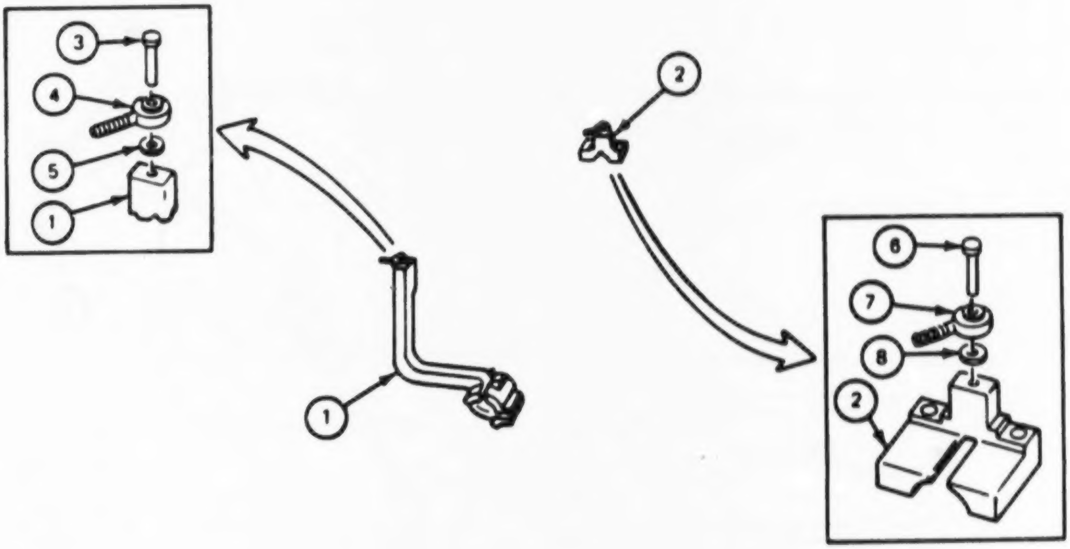
Step	Procedure
	SUPPORT SHOP WORK
1.	Take housing (1) to shop where press is available. a. Press out two bearings (2). b. Press out two bearing disks (3). c. Press in two new bearing disks (3). d. Press in two new bearings (2).
2.	After support shop work, return parts to turret shop. GO TO FRAME 2



13-100. HOUSING REPAIR PROCEDURE (CONT)

FRAME 2

Step	Procedure
	SUPPORT SHOP WORK
1.	Take support (1) and clamp (2) to shop where pin extractor and press are available.
	a. Remove pin (3), rod end (4), and washer (5) from support (1).
	b. Remove pin (6), rod end (7), and washer (8) from clamp (2).
	c. Put washer (8) and new rod end (7) on clamp (2) and press in new pin (7).
	d. Put washer (5) and new rod end (4) on support (1) and press in new pin (3).
2.	After support shop work, return parts to turret shop.
	END OF TASK



13-101. POWER SOLENOID AND OVERRIDE SOLENOID TEST PROCEDURE

TEST EQUIPMENT: Multimeter

PERSONNEL: One

REFERENCES: JPG for procedures to check continuity

PRELIMINARY PROCEDURES: Remove power solenoid and override solenoid (para 13-102)

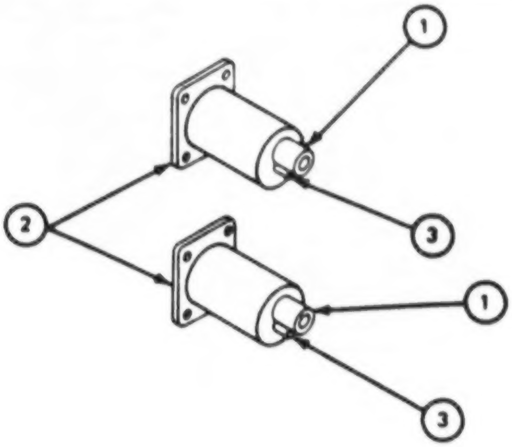
GENERAL INSTRUCTIONS:

NOTE

If part is bad, order repair part or next higher assembly as required.

FRAME 1

Step	Procedure
1.	Using multimeter, check continuity of each solenoid winding between electrical connector (1) and solenoid case (2) (JPG). Normal indication is less than 2 ohms. **NOTE** If solenoid plunger (3) does not move easily, solenoid is bad.
2.	Using hand, carefully move solenoid plunger (3) in and out. END OF TASK



13-102. POWER SOLENOID AND OVERRIDE SOLENOID REMOVAL PROCEDURE

TOOLS: 5/32" socket head screw key (Allen wrench)

PERSONNEL: One

REFERENCES: TM 9-2350-257-20-2-3 for procedure to lower hydraulic system pressure
JPG for procedure to disconnect electrical connectors

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Gunner's Control Box	FO-1	2
Turret Traverse Lock	FO-4	6
Gunner's Control	FO-1	5

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Gunner's control box ELEV/TRAV switch set to OFF
Turret traverse lock set to LOCKED

GENERAL INSTRUCTIONS:

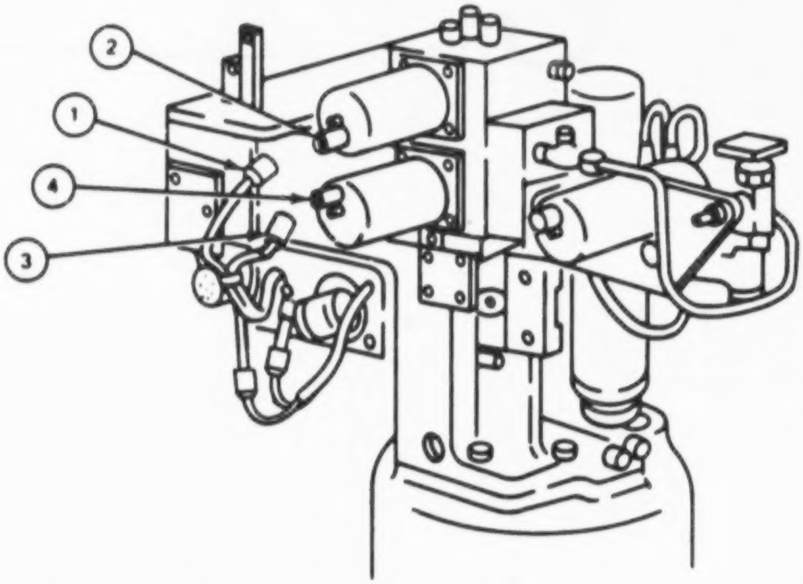
NOTE

Equipment conditions apply only if task is being done on vehicle.

13-102. POWER SOLENOID AND OVERRIDE SOLENOID REMOVAL PROCEDURE (CONT)

FRAME 1

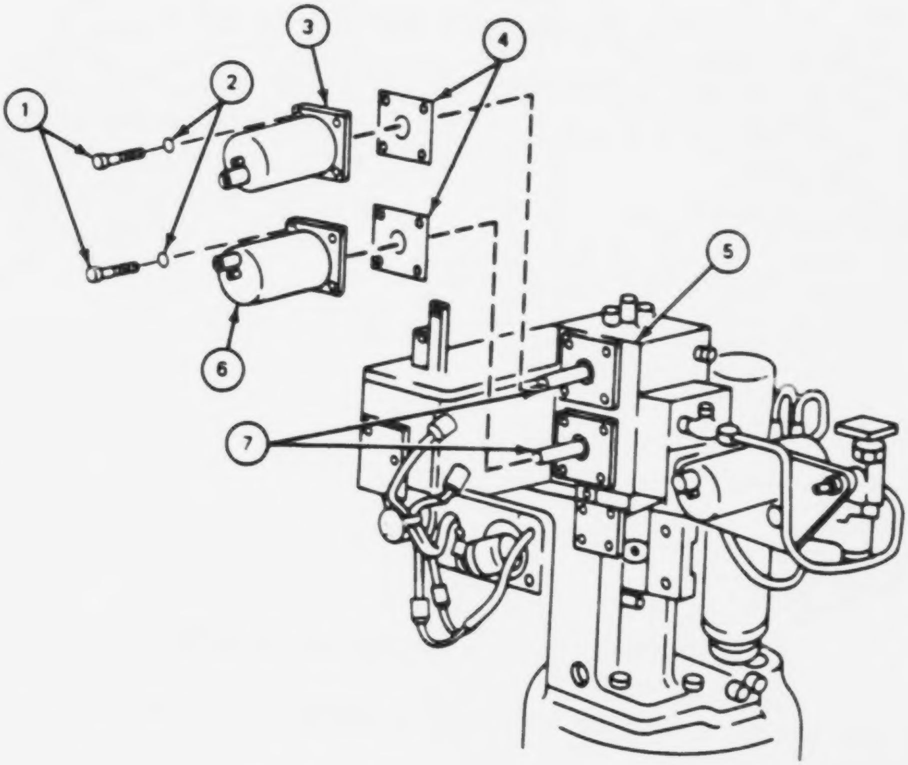
Step	Procedure
	WARNING Before removing hydraulic tubes or parts, hydraulic pressure must be lowered to 0 psi. Hydraulic fluid under pressure can hurt you.
1.	Lower hydraulic system pressure to 0 psi (TM-20-2-3).
2.	Using hands, disconnect electrical connector 625A (1) from power solenoid (2) (JPG).
3.	Using hands, disconnect electrical connector 623 (3) from override solenoid (4) (JPG).
	GO TO FRAME 2



13-102. POWER SOLENOID AND OVERRIDE SOLENOID REMOVAL PROCEDURE (CONT)

FRAME 2

Step	Procedure
	CAUTION Spring-loaded parts (7) may drop out of hydraulic valve body (5) when solenoids (3) and (6) are removed.
1.	Using Allen wrench, remove four screws (1) and four lockwashers (2) that attach power solenoid (3) and gasket (4) to hydraulic valve body (5). Remove solenoid (3). Throw gasket away.
2.	Using Allen wrench, remove four screws (1) and four lockwashers (2) that attach override solenoid (6) and gasket (4) to hydraulic valve body (5). Remove solenoid. Throw gasket away.
	NOTE Follow-on Maintenance Action Required: Test power solenoid and override solenoid (para 13-101)
	END OF TASK



13-103. POWER SOLENOID AND OVERRIDE SOLENOID INSTALLATION PROCEDURE

TOOLS: 5/32" socket head screw key (Allen wrench)
5/32" hex head socket (3/8" drive)
3/8" drive torque wrench (0 to 100 inch-pounds)
6" extension (3/8" drive)

SUPPLIES: Gasket, 10916206 (two)

PERSONNEL: One

REFERENCES: TM 9-2350-257-20-2-3 for procedure to bleed hydraulic system
JPG for procedures to:
    Connect electrical connectors
    Use torque wrench
TM 9-2350-257-10 for procedure to traverse turret and elevate and depress guns in power mode

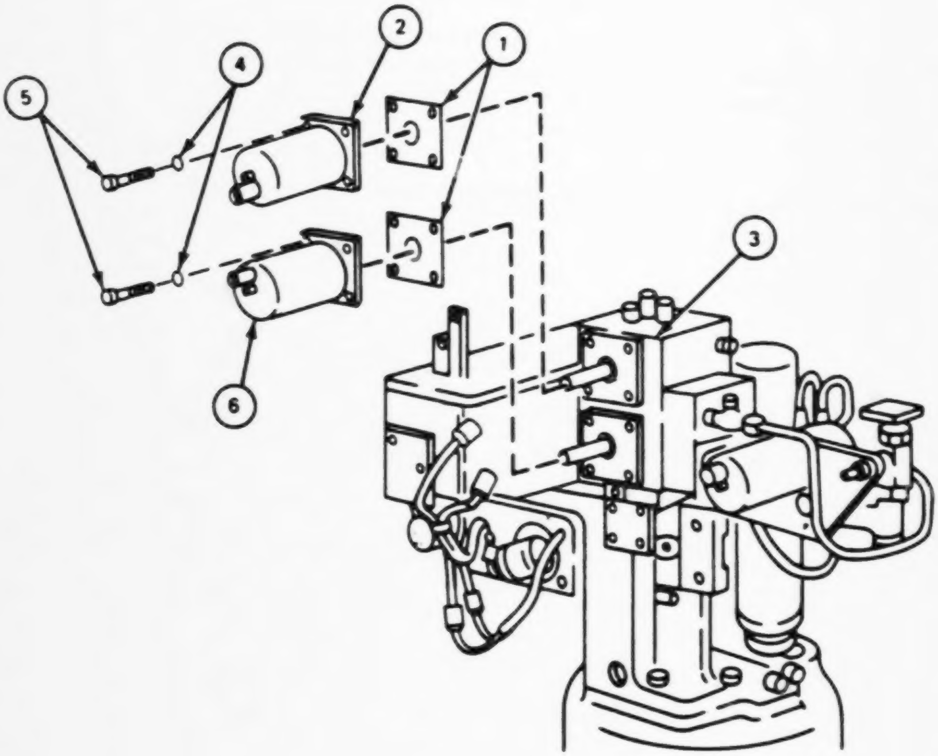
GENERAL INSTRUCTIONS:

CAUTION

All hydraulic parts being assembled must be clean. Dirt can damage hydraulic parts.

FRAME 1

Step	Procedure
	NOTE Power solenoid (2) electrical connector must be below solenoid pushbutton.
1.	Using Allen wrench, attach gasket (1) and power solenoid (2) to valve body (3) with four lockwashers (4) and four screws (5).
2.	Using hex head socket with torque wrench and extension, torque four screws (5) to between 24 and 36 inch-pounds (JPG).
	NOTE Override solenoid (6) electrical connector must be above solenoid pushbutton.
3.	Repeat steps 1 and 2 to install override solenoid (6).
	GO TO FRAME 2



13-103. POWER SOLENOID AND OVERRIDE SOLENOID INSTALLATION PROCEDURE (CONT)

FRAME 2

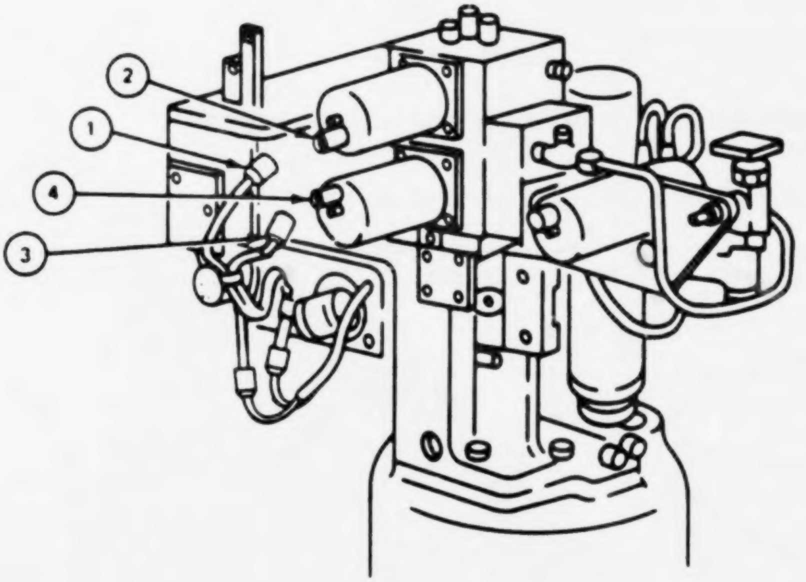
Step	Procedure
1.	Using hands, connect electrical connector 625A (1) to power solenoid (2) (JPG).
2.	Using hands, connect electrical connector 623 (3) to override solenoid (4) (JPG).

NOTE

Follow-on Maintenance Action Required:

Bleed hydraulic system (TM-20-2-3).
Traverse turret and elevate and depress guns in power mode to check operation of power and override solenoids (TM-10).

END OF TASK



All data on pages 13-390 thru 13-393, including paragraph 3-104, deleted.

13-105. HYDRAULIC VALVE TEST PROCEDURE

TEST EQUIPMENT:
- 24-28 volt DC power supply
- Watch (or clock) with sweep-second hand
- M3 oil pump
- Pressure gauge (0-500 psi)
- Hydraulic valve test manifold (fabricated tool, item 13, App. B)
- Hydraulic valve test fixture (fabricated tool, item 14, App. B)
- Hydraulic valve test fixture adapter (fabricated tool, item 15, App. B)
- Measuring cup (two)
- Suitable hydraulic fittings, packings, and tools
- Pressure gauge (0-2000 psi)
- Drift pin punch

SUPPLIES: Rags (item 21, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
- Use M3 oil pump
- Use 0-36 VDC power supply

PRELIMINARY PROCEDURES:
- Remove hydraulic valve (para 13-98)
- Assemble hydraulic valve (para 13-107)
- Install power solenoid and override solenoid (para 13-103)

GENERAL INSTRUCTIONS:

NOTE

Suitable fittings, parts and tools should be used as required to connect test equipment to parts being tested.

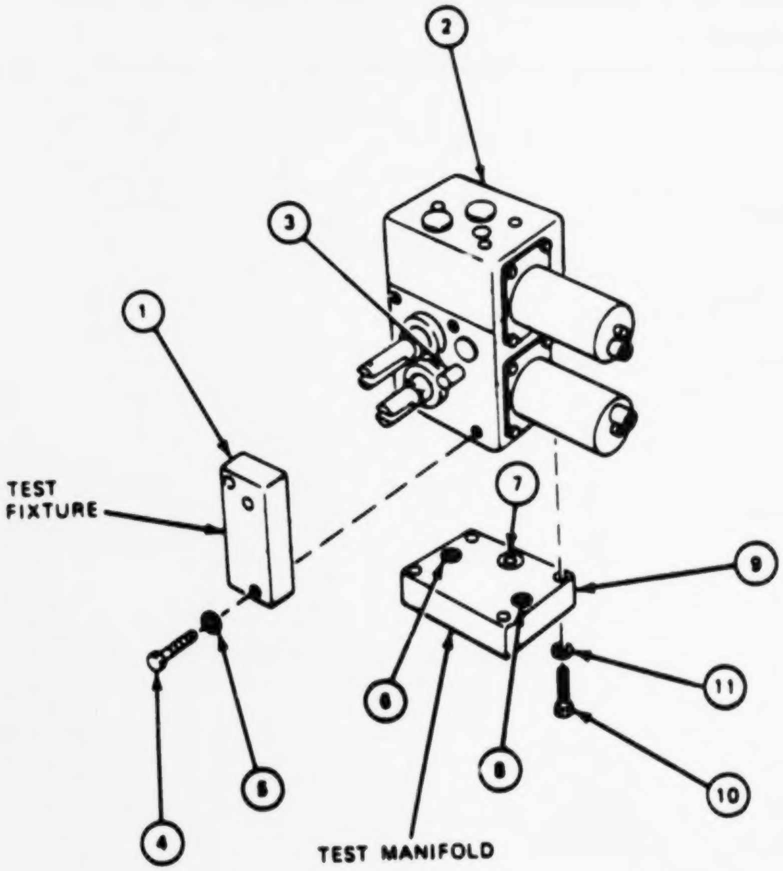
Rags should be used to clean up spilled oil.

If normal indication is not obtained, hydraulic valve is bad. Disassemble bad hydraulic valve (para 13-106).

13-105. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 1

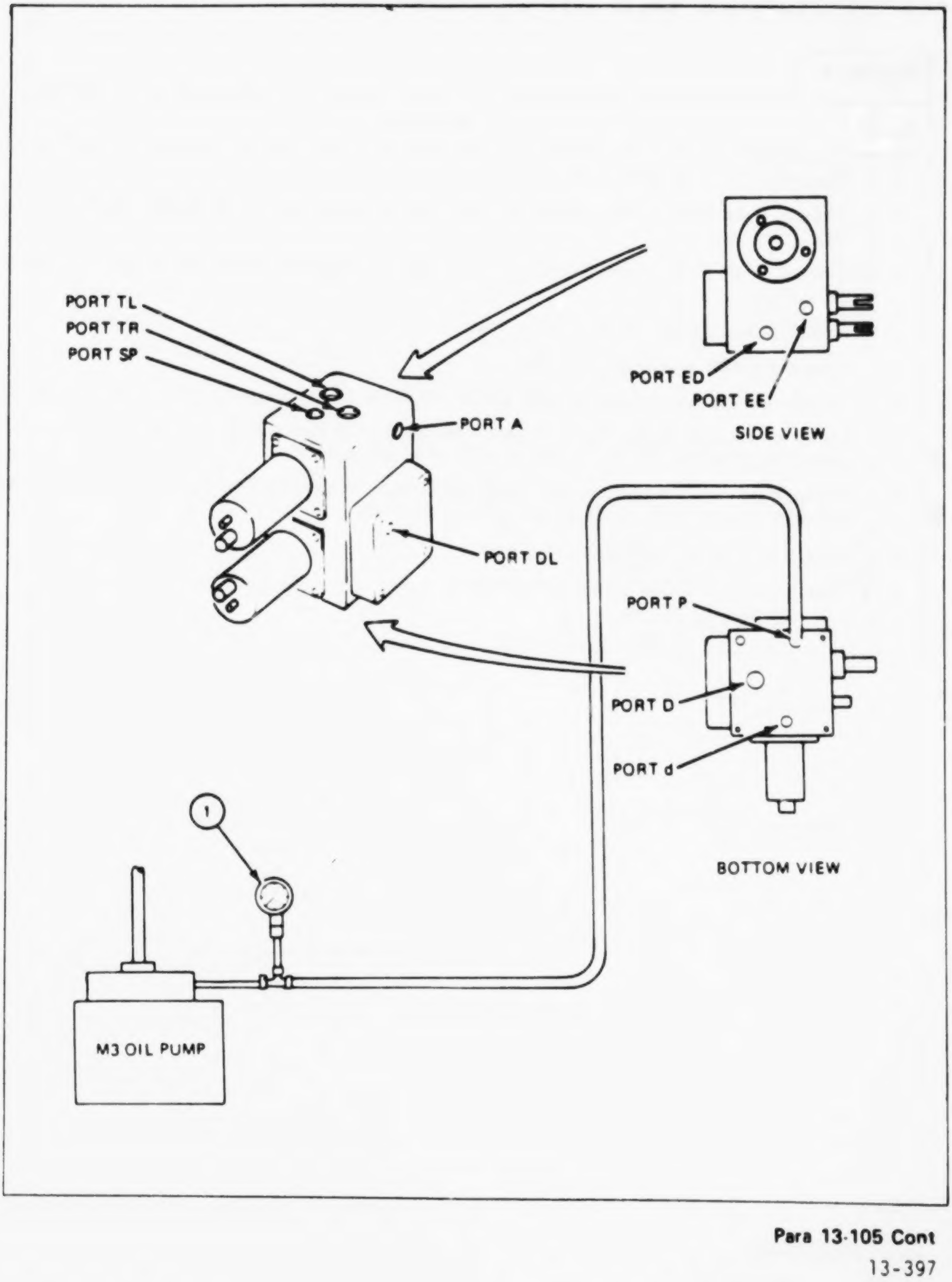
Step	Procedure
1	Put hydraulic valve test fixture (1) on side of hydraulic valve (2) over end of override piston (3) and attach with two screws (4) and two washers (5).
2	Coat three preformed packings (6), (7) and (8) with hydraulic fluid.
3	Put preformed packings (6), (7) and (8) in three packing recesses on inner surface of test manifold (9).
4	Attach test manifold (9) to bottom of hydraulic valve (2) with four screws (10) and four washers (11).
	GO TO FRAME 2



13-105. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Assemble M3 oil pump with 2000 psi gauge (1) as shown.
2.	Connect M3 oil pump to port P.
3.	Plug port SP.
4.	Slowly operate M3 oil pump until gauge (1) indicates between 900 and 950 psi (JPG).
5.	Using watch and measuring cups, check for leakage at port A and port D. Leakage at either port shall not exceed 3.5 ml at 75°F or 5.0 ml at 95°F.
6.	Check for any leakage at ports TL, TR, ED EE, d, and DL. There shall be no leakage.
7.	Slowly release M3 oil pump pressure until gauge (1) indicates 0 psi (JPG).
	GO TO FRAME 3

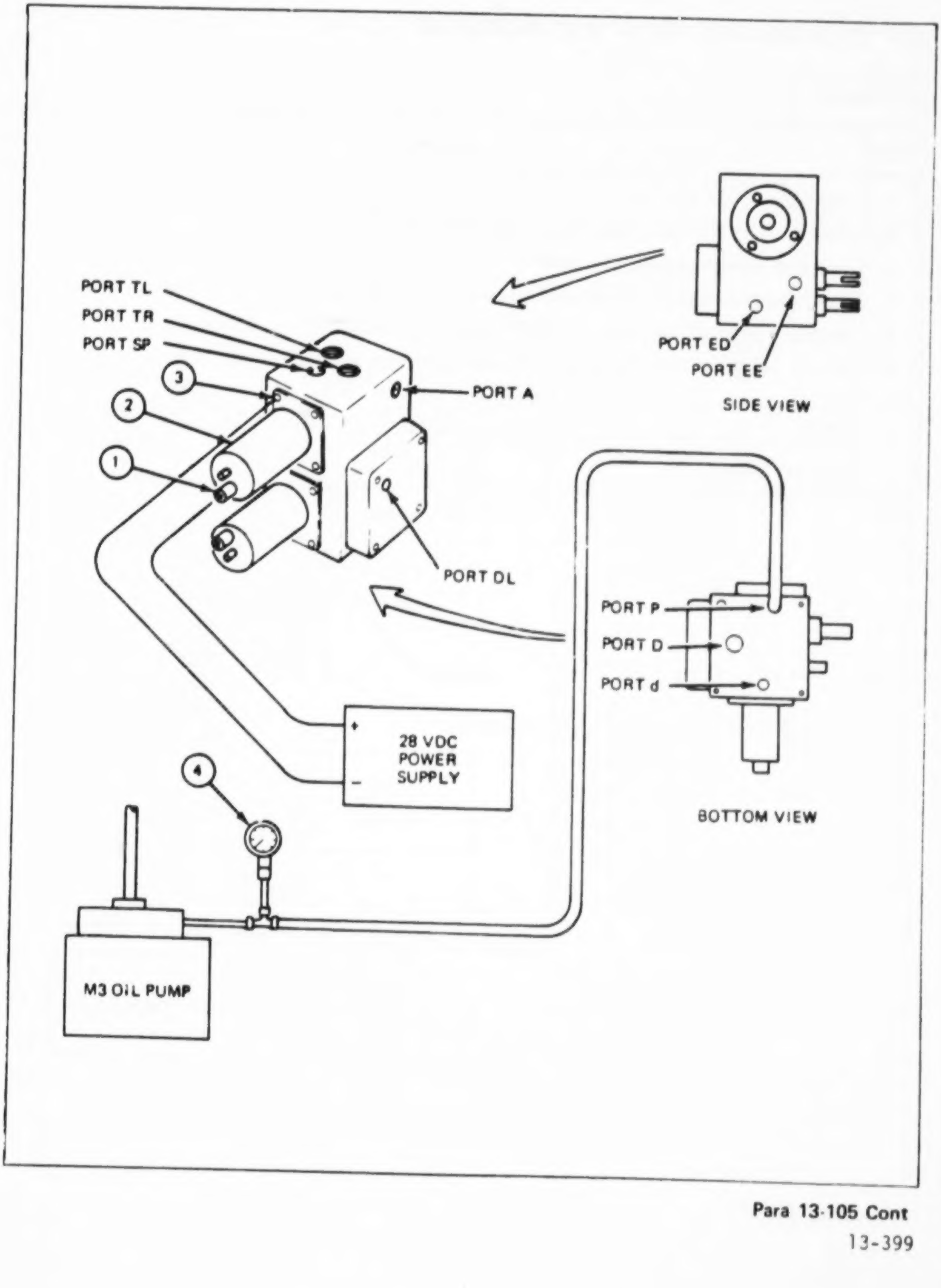

PORT TL
PORT TR
PORT SP
PORT A
PORT DL
PORT ED
PORT EE
SIDE VIEW
PORT P
PORT D
PORT d
BOTTOM VIEW
1
M3 OIL PUMP

13-105. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Plug ports TL, TR, DL, and A.
2.	Connect 0-36 VDC power supply positive lead to connector (1) of power solenoid (2) (JPG).
3.	Connect 0-36 VDC power supply negative lead to mounting screw (3) of power solenoid (2) (JPG).
4.	Adjust power supply to 28 VDC (JPG).
5.	Energize power solenoid (2) (JPG).
6.	Slowly operate M3 oil pump until gauge (4) indicates between 900 and 950 psi (JPG).
7.	Using watch and measuring cups, check for leakage at ports ED, EE, and D. Leakage at each port shall not exceed 2.5 ml at 75°F or 3.5 ml at 95°F.
8.	Using watch and measuring cup, check for leakage at port D. Leakage at port D shall not exceed 5.0 ml at 75°F or 7.5 ml at 95°F per minute.
9.	De-energize power solenoid (2) (JPG).
10.	Slowly release M3 oil pump pressure until gauge (4) indicates 0 psi (JPG). GO TO FRAME 4

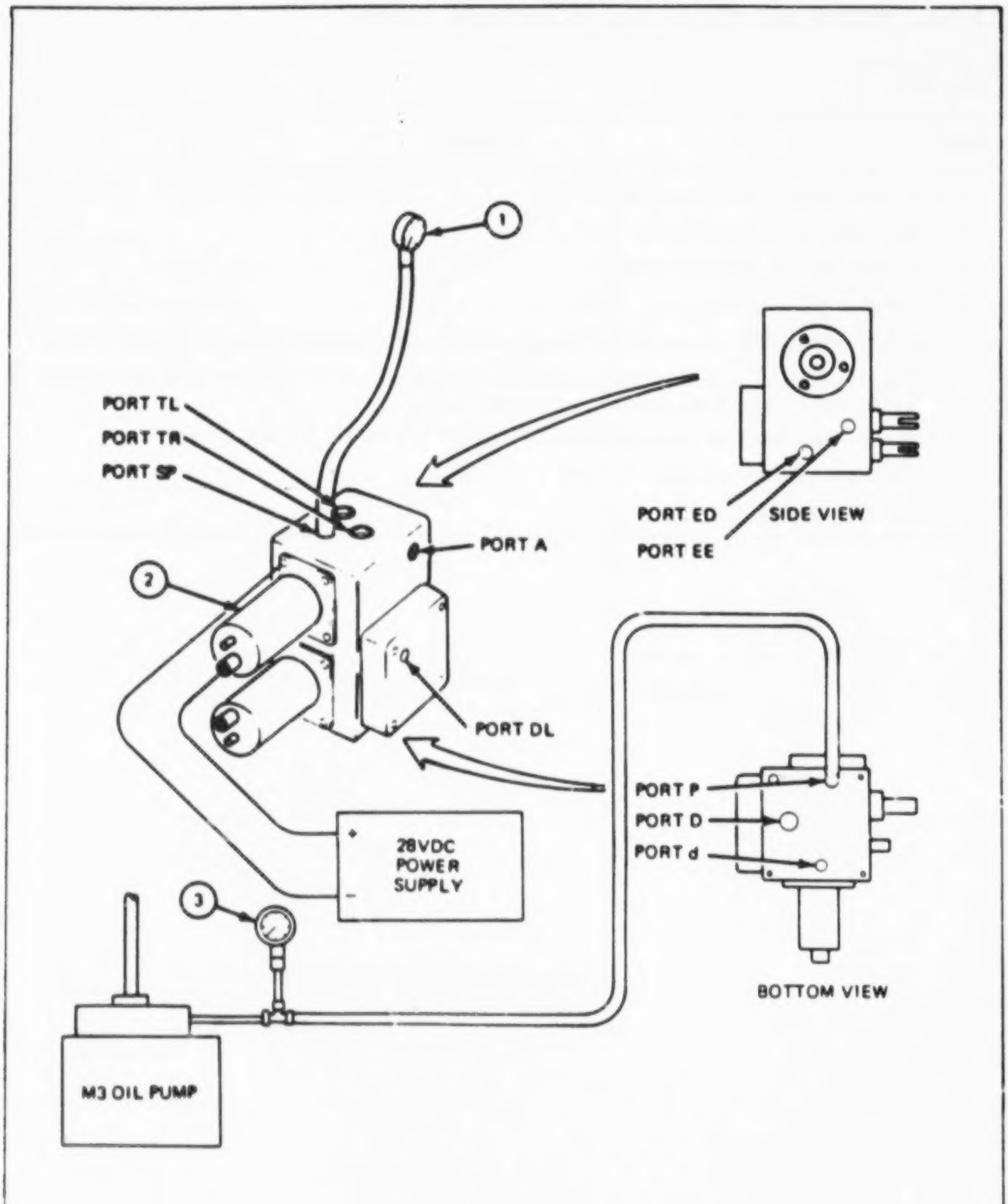
Para 13-105 Cont


PORT TL
PORT TR
PORT SP
3
2
1
PORT A
PORT DL
PORT ED
PORT EE
SIDE VIEW
PORT P
PORT D
PORT d
BOTTOM VIEW
+
28 VDC
POWER
SUPPLY
−
4
M3 OIL PUMP

13-105. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 4

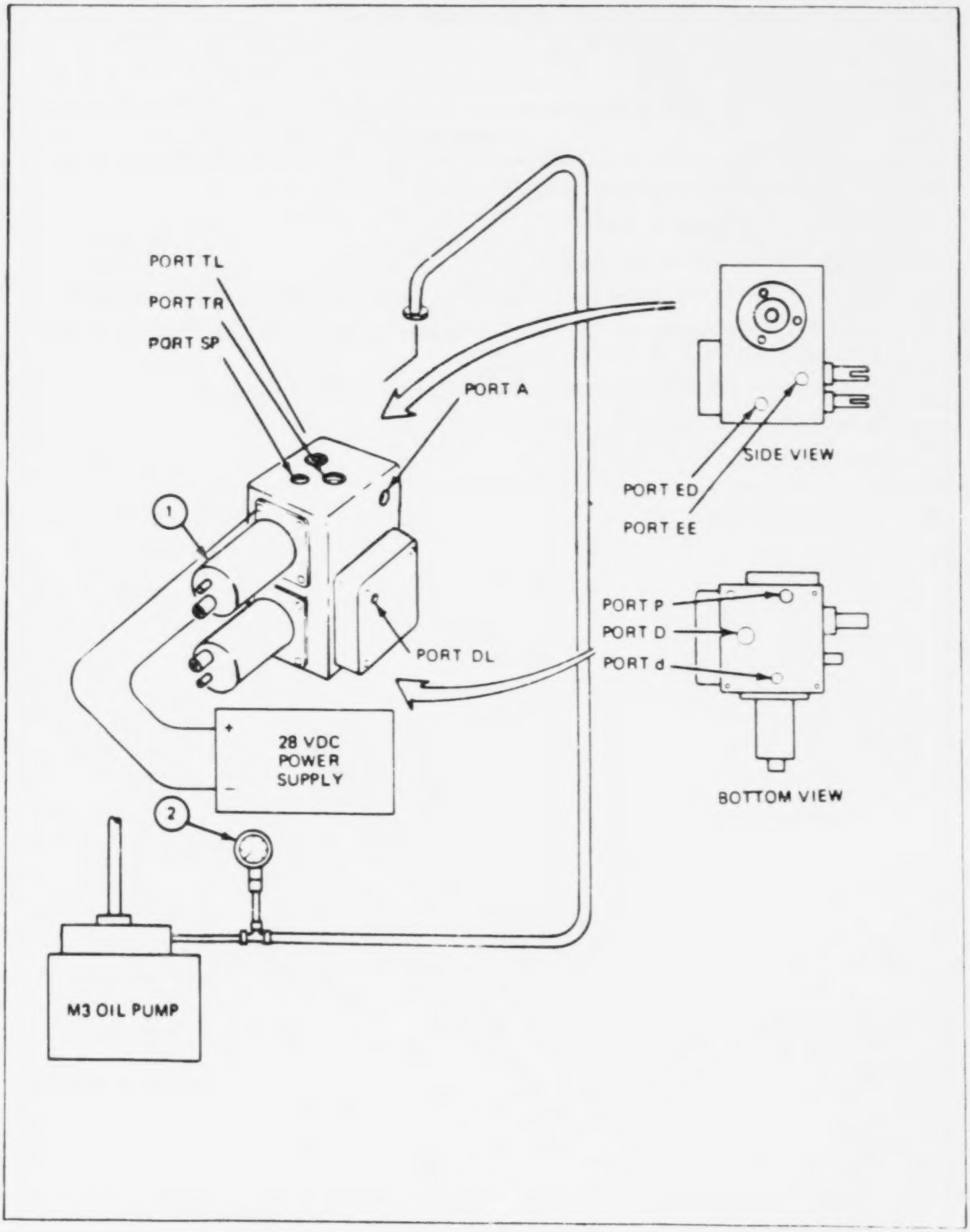
Step	Procedure
1.	Unplug ports SP and DL.
2.	Connect 0 to 500 psi gauge (1) to port SP.
3.	Energize power solenoid (2) (JPG).
4.	Slowly operate M3 oil pump until gauge (3) indicates between 900 and 950 psi (JPG).
5.	Pressure indicated on gauge (1) shall indicate between 100 and 150 psi.
6.	Slowly release M3 oil pump pressure until gauge (3) indicates 0 psi (JPG).
7.	De-energize power solenoid (2) (JPG).
8.	Disconnect 0 to 500 psi gauge (1) from port SP.
	GO TO FRAME 5


①
PORT TL
PORT TR
PORT SP
PORT A
PORT ED
SIDE VIEW
PORT EE
②
PORT DL
PORT P
PORT D
PORT d
+
28VDC POWER SUPPLY
−
③
BOTTOM VIEW
M3 OIL PUMP

13-105. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 5

Step	Procedure
1.	Unplug ports TR, TL, and A.
2.	Disconnect M3 oil pump from port P.
3.	Connect M3 oil pump to port TR.
4.	Energize power solenoid (1) (JPG).
5.	Slowly operate M3 oil pump until gauge (2) indicates between 900 and 950 psi (JPG).
6.	Using watch and measuring cup, check for leakage at port D. Leakage shall not exceed 3.0 ml at 75°F or 4.5 ml at 95°F per minute.
7.	Slowly release M3 oil pump pressure until gauge (2) indicates 0 psi (JPG).
8.	De-energize power solenoid (1) (JPG).
	GO TO FRAME 6

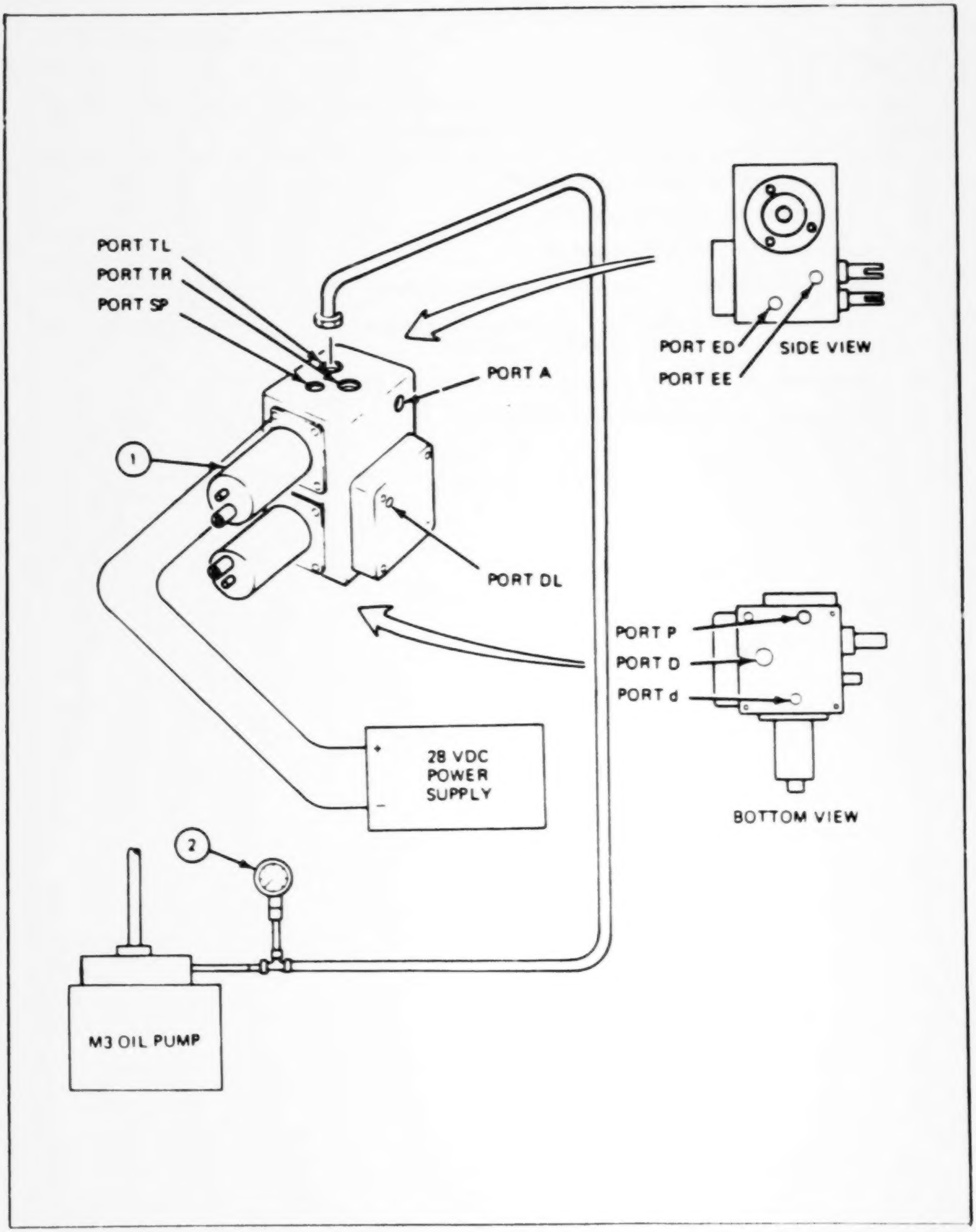

PORT TL
PORT TR
PORT SP
PORT A
1
PORT DL
SIDE VIEW
PORT ED
PORT EE
PORT P
PORT D
PORT d
BOTTOM VIEW
+
28 VDC
POWER
SUPPLY
−
2
M3 OIL PUMP

13-105. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 6

Step	Procedure
1.	Disconnect M3 oil pump from port TR.
2.	Connect M3 oil pump to port TL.
3.	Energize power solenoid (1) (JPG).
4.	Slowly operate M3 oil pump until gauge (2) indicates between 900 and 950 psi (JPG).
5.	Using watch and measuring cup, check for leakage at port D. Leakage shall not exceed 3.0 ml at 75°F or 4.5 ml at 95°F per minute.
6.	Slowly release M3 oil pump pressure until gauge (2) indicates 0 psi (JPG).
7.	De-energize power solenoid (1) (JPG).
	GO TO FRAME 7

Para 13-105 Cont

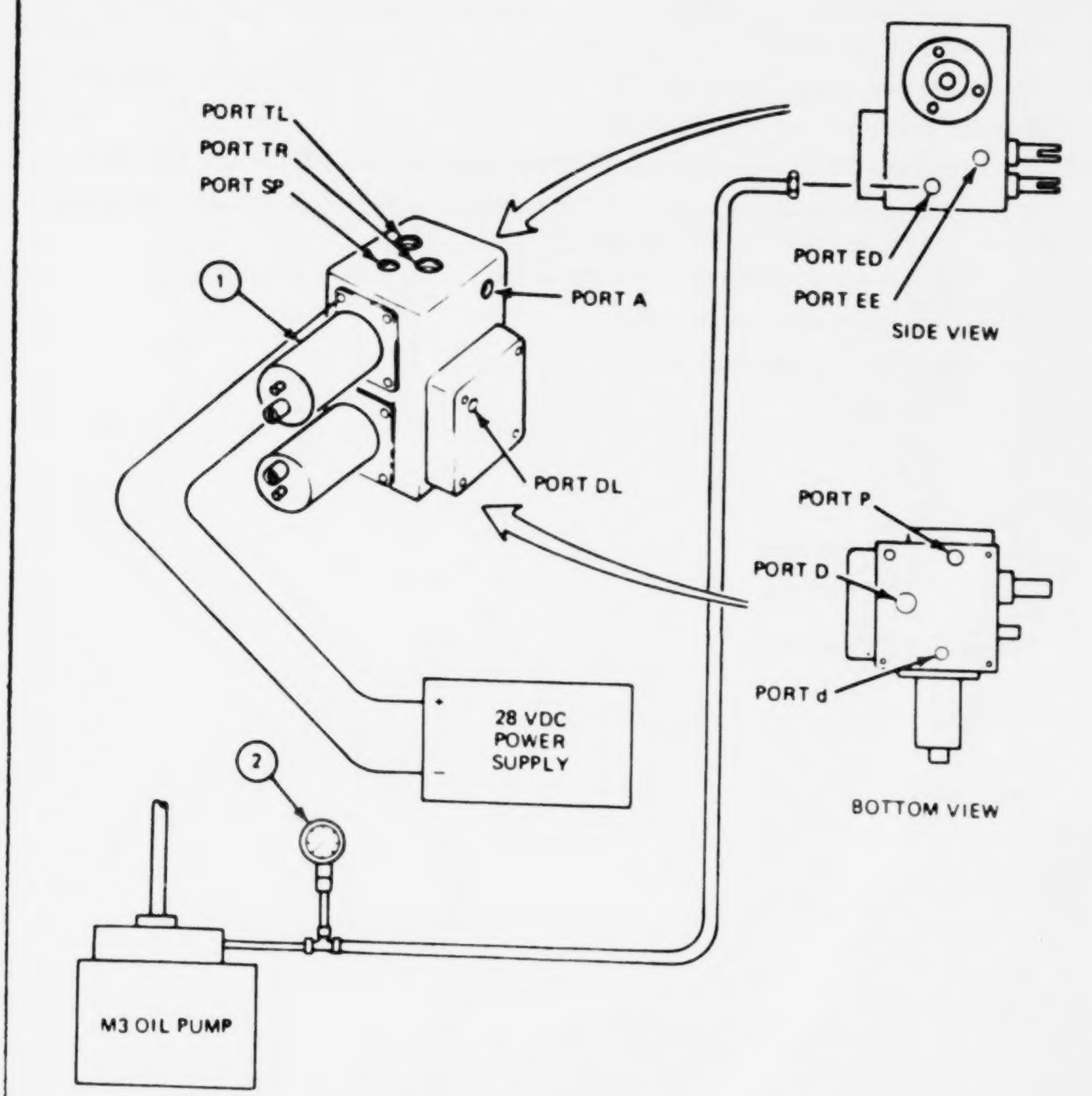

PORT TL
PORT TR
PORT SP
PORT A
1
PORT DL
PORT ED
SIDE VIEW
PORT EE
PORT P
PORT D
PORT d
BOTTOM VIEW
+
28 VDC
POWER
SUPPLY
−
2
M3 OIL PUMP

13-105. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 7

Step	Procedure
1.	Disconnect M3 oil pump from port TL.
2.	Connect M3 oil pump to port ED.
3.	Energize power solenoid (1) (JPG)
4.	Slowly operate M3 oil pump until gauge (2) indicates between 900 and 950 psi (JPG)
5.	Using watch and measuring cup, check for leakage at port D. Leakage shall not exceed 2.0 ml at 75°F or 3.0 ml at 95°F per minute.
6.	Slowly release M3 oil pump pressure until gauge (2) indicates 0 psi (JPG)
7.	De-energize power solenoid (1) (JPG)
	GO TO FRAME 8

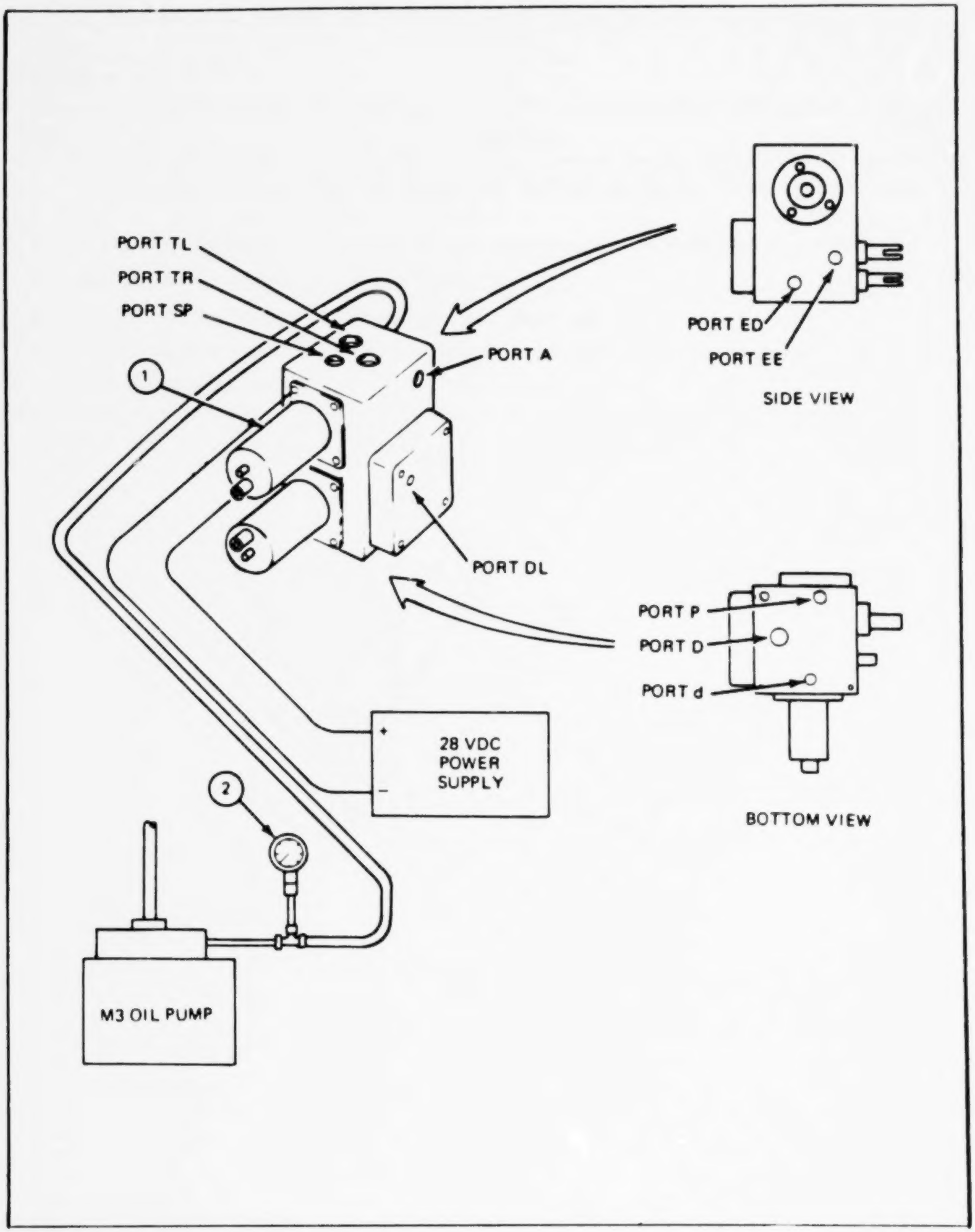
Para 13-105 Cont


PORT TL
PORT TR
PORT SP
①
PORT A
PORT DL
PORT ED
PORT EE
SIDE VIEW
PORT P
PORT D
PORT d
BOTTOM VIEW
+
−
28 VDC
POWER
SUPPLY
②
M3 OIL PUMP

13-105. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 8

Step	Procedure
1	Disconnect M3 oil pump from port ED
2	Connect M3 oil pump to port EE
3	Energize power solenoid (1) (JPG)
4	Slowly operate M3 oil pump until gauge (2) indicates between 900 and 950 psi (JPG).
5	Using watch and measuring cup, check for leakage at port D. Leakage shall not exceed 2.0 ml at 75°F or 3.0 ml at 95°F per minute.
6	Slowly release M3 oil pump pressure until gauge (2) indicates 0 psi (JPG)
7	De-energize power solenoid (1) (JPG)
8	Disconnect M3 oil pump from port EE
	GO TO FRAME 9

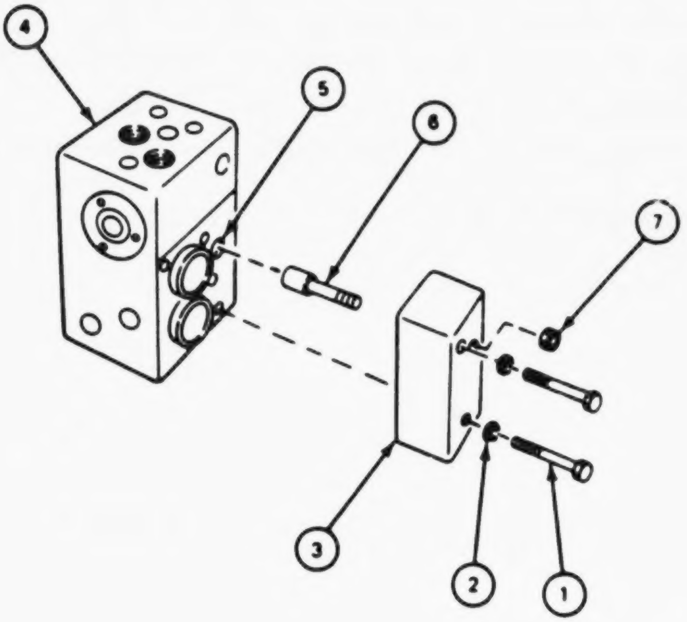

PORT TL
PORT TR
PORT SP
PORT A
①
PORT DL
PORT ED
PORT EE
SIDE VIEW
PORT P
PORT D
PORT d
BOTTOM VIEW
+
−
28 VDC POWER SUPPLY
②
M3 OIL PUMP

Para 13-105 Cont

13-105. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 9

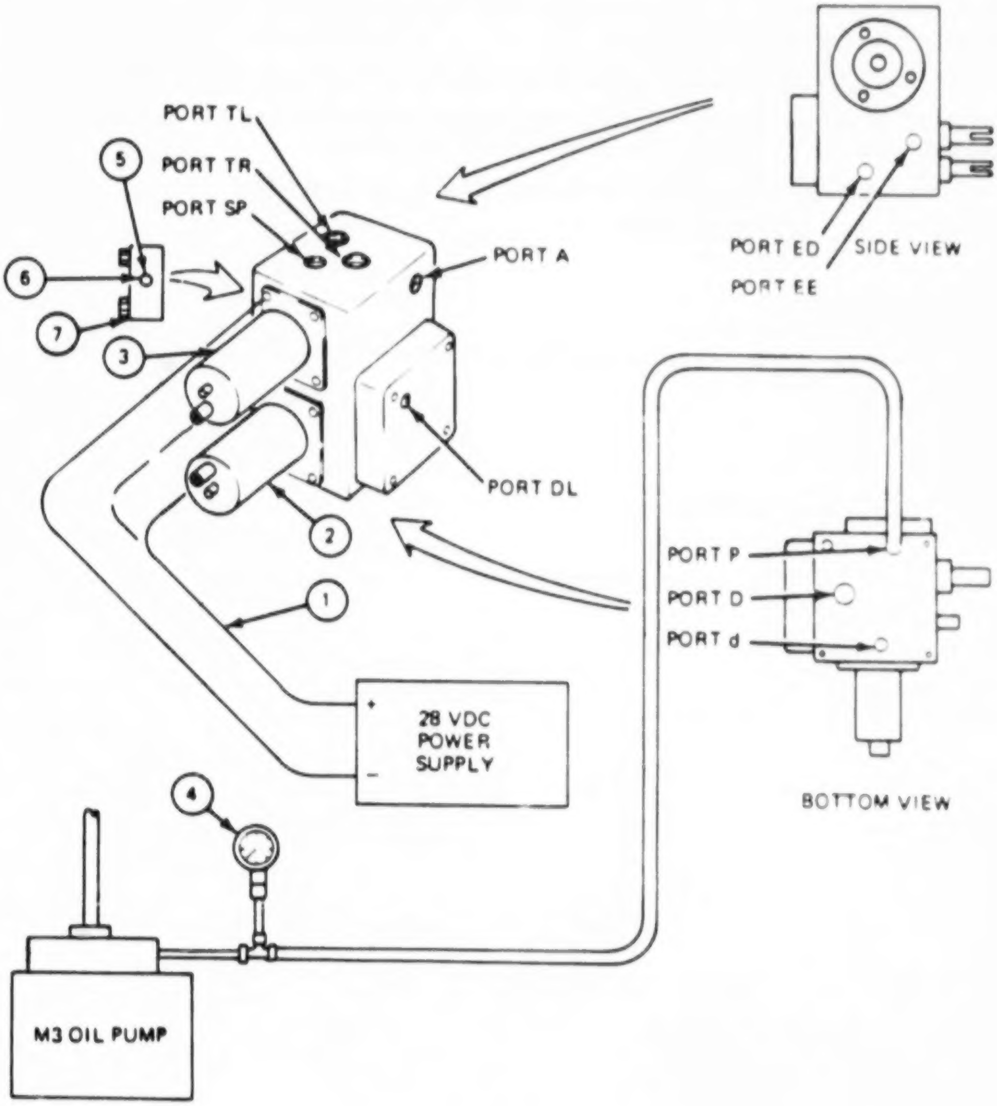
Step	Procedure
1.	Remove two screws (1) and two washers (2) holding test fixture (3) on hydraulic valve (4).
2.	Using drift pin punch, remove low pressure regulator plug (5) from hydraulic valve (4).
3.	Put test fixture adapter (6) in test fixture (3).
4.	Put nut (7) on adapter (6) and tighten nut finger tight.
5.	Place test fixture (3) on hydraulic valve (4). Install two screws (1) and two washers (2). GO TO FRAME 10



13-105. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 10

Step	Procedure
1.	Plug port A.
2.	Connect M3 oil pump to port P.
3.	Connect another positive test lead (1) to connector on override solenoid (2).
4.	Energize power solenoid (3) and override solenoid (2) (JPG).
5.	Slowly operate M3 oil pump until gauge (4) indicates between 900 and 950 psi (JPG).
	NOTE Movement and leakage (if any) of override piston (5) can be seen through hole (6) in side of hydraulic valve test fixture (7).
6.	Check for override piston (5) movement and leakage. There shall be no leakage. Piston should be visible (extended) through hole (6).
7.	Slowly release M3 oil pump pressure until gauge (4) indicates 0 psi 0JPG).
8.	De-energize power solenoid (3) and override solenoid (2) (JPG).
9.	Check that override piston (5) has moved inward. Piston should not be visible through hole (6).
10.	Remove test lead (3) to connector on override solenoid (2).
	GO TO FRAME 11

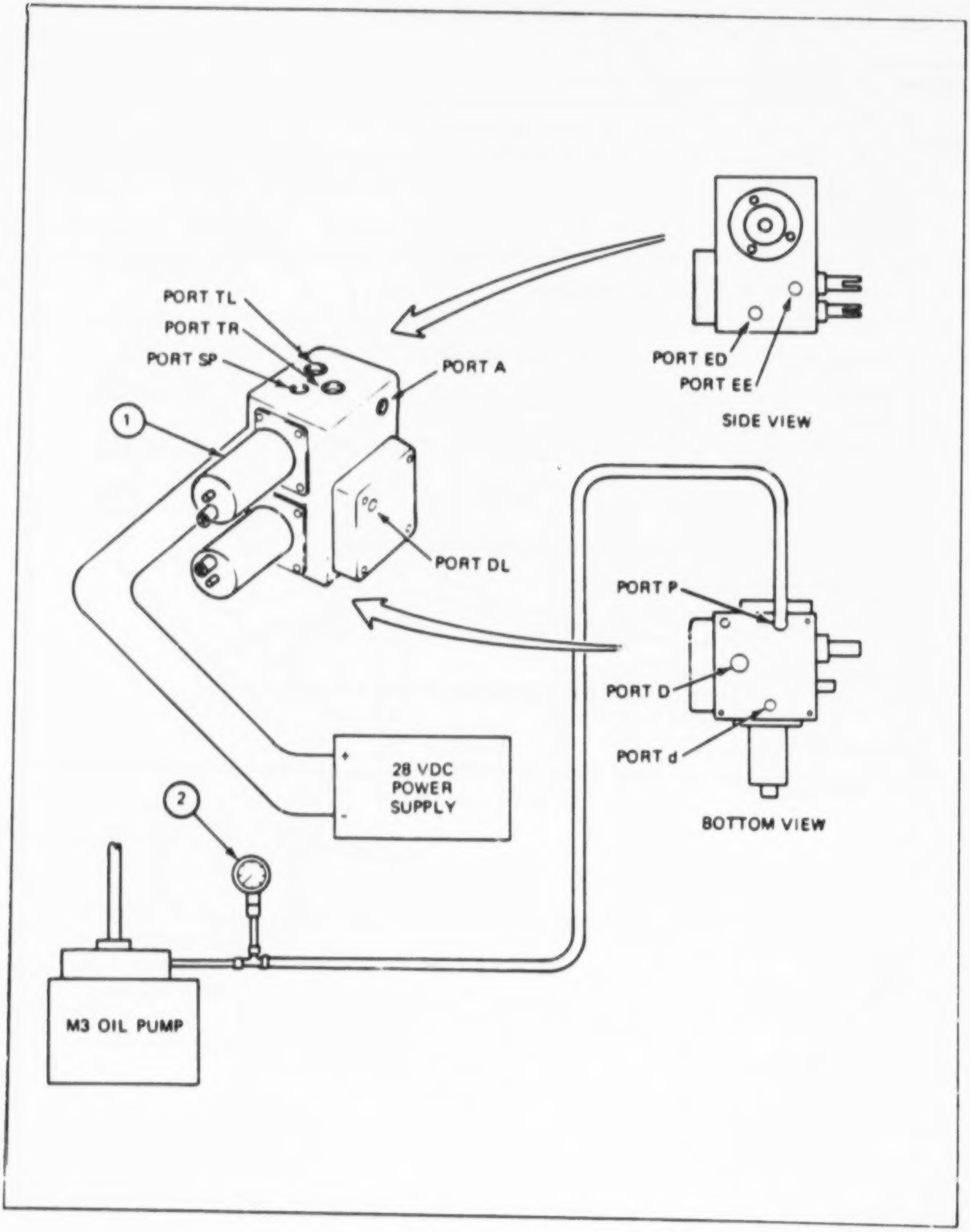

PORT TL
5
PORT TR
PORT SP
6
7
3
PORT A
PORT ED
SIDE VIEW
PORT EE
PORT DL
2
PORT P
PORT D
PORT d
1
+
28 VDC
POWER
SUPPLY
–
BOTTOM VIEW
4
M3 OIL PUMP

Para 13-105 Cont

13-105. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 11

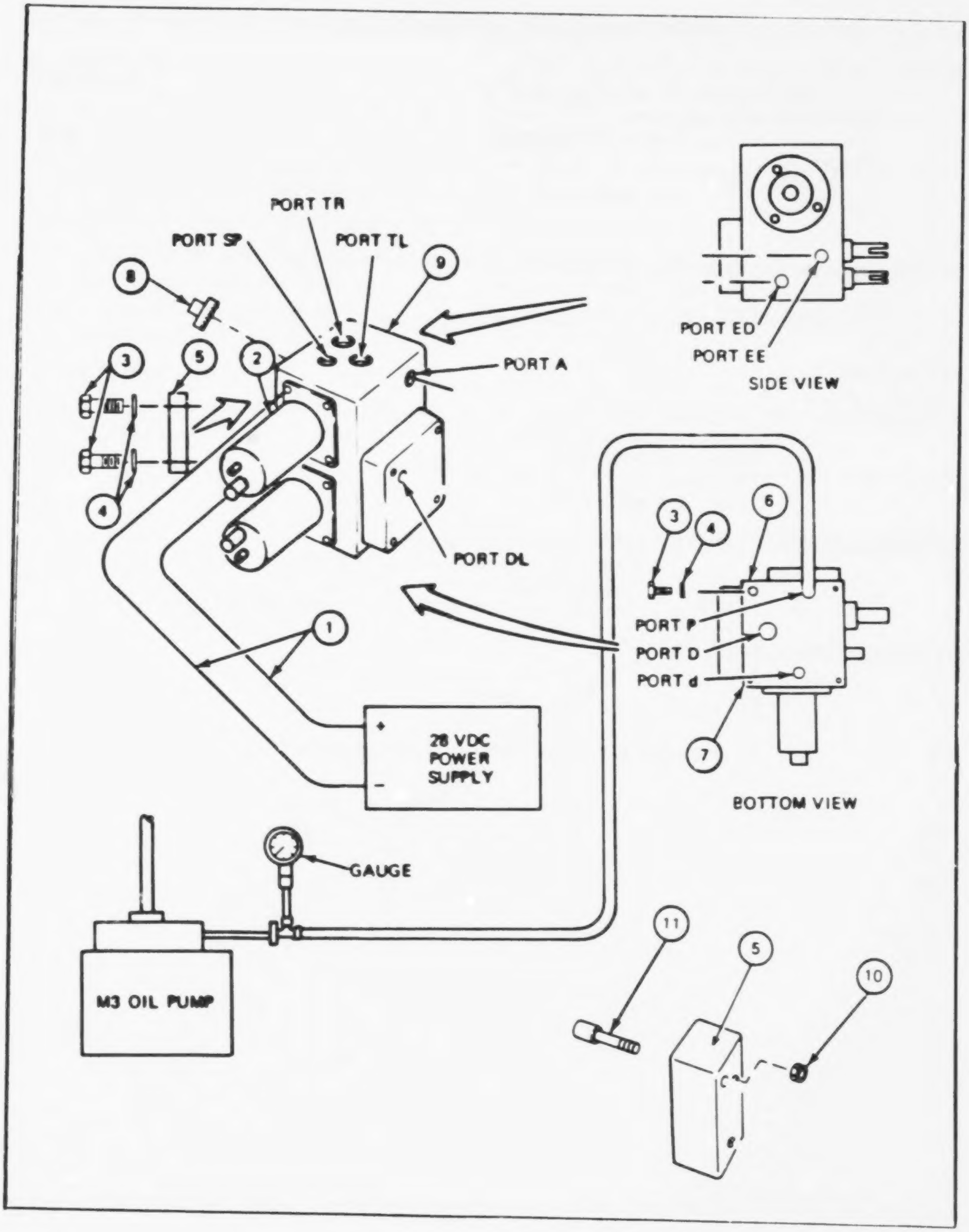
Step	Procedure
1.	Energize power solenoid (1) (JPG).
2.	Slowly operate M3 oil pump until gauge (2) indicates between 900 and 950 psi (JPG).
3.	**Using watch and measuring cup, check for leakage at ports TL and TR. Leakage shall not exceed 3.5 ml at 75°F or 5.0 ml at 95°F per minute.**
4.	Slowly release M3 oil pump pressure until gauge (2) indicates 0 psi (JPG).
5.	De-energize power solenoid (1) (JPG).
	GO TO FRAME 12


PORT TL
PORT TR
PORT SP
PORT A
PORT ED
PORT EE
SIDE VIEW
1
PORT DL
PORT P
PORT D
PORT d
BOTTOM VIEW
+
28 VDC
POWER
SUPPLY
-
2
M3 OIL PUMP

13-105. HYDRAULIC VALVE TEST PROCEDURE (CONT)

FRAME 12

Step	Procedure
1.	Unblock port A.
2.	Disconnect M3 oil pump from port P.
3.	Disconnect 28 volt power supply test leads (1) from power solenoid (2) (JPG).
4.	Disassemble M3 oil pump and remove gauge.
5.	Remove two screws (3), two washers (4), and hydraulic valve test fixture (5).
6.	Remove four screws (3), four washers (4), and hydraulic valve test manifold (6).
7.	Remove three preformed packings (7) from hydraulic valve test manifold (6). Put pressure regulator plug (8) in valve body (9).
8.	Remove nut (10) from adapter (11) and remove adapter from test fixture (5).
	NOTE **Do not drain hydraulic fluid from valve.**
9.	Put protective plugs in open ports.
	NOTE If normal indication is obtained in Frames 1 through 12, hydraulic valve is good.
	END OF TASK


PORT TR
PORT SP
PORT TL
9
8
2
3
5
PORT A
4
PORT DL
1
+
28 VDC
POWER
SUPPLY
−
GAUGE
M3 OIL PUMP
PORT ED
PORT EE
SIDE VIEW
3
4
6
PORT P
PORT D
PORT d
7
BOTTOM VIEW
11
5
10

13-106. HYDRAULIC VALVE DISASSEMBLY PROCEDURE

TOOLS: O-ring extractor kit
3/16" socket head screw key (Allen wrench)
Internal retaining ring pliers
1/4" socket head screw key (Allen wrench)
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Lint-free cloths (item 21, App. A)
Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Remove preformed packing
Remove retaining rings
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Test gunner's control (para 13-72)
Remove hydraulic valve (para 13-98)
Test hydraulic valve (para 13-105)
Remove power solenoid and override solenoid (para 13-102)

GENERAL INSTRUCTIONS:

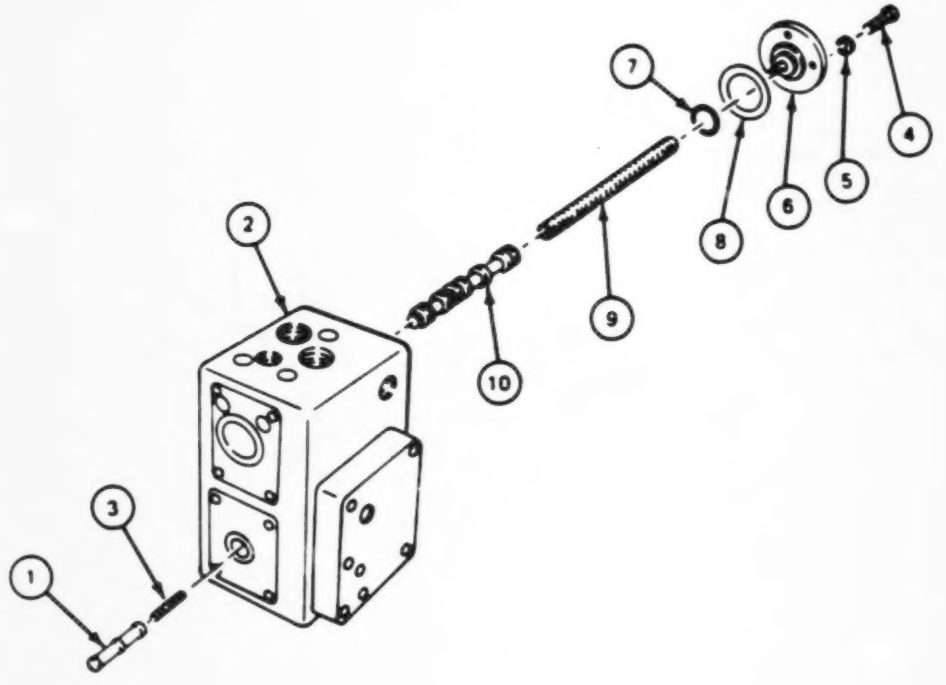
NOTE

Use lint-free cloths to keep hydraulic parts clean.

13-106. HYDRAULIC VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 1

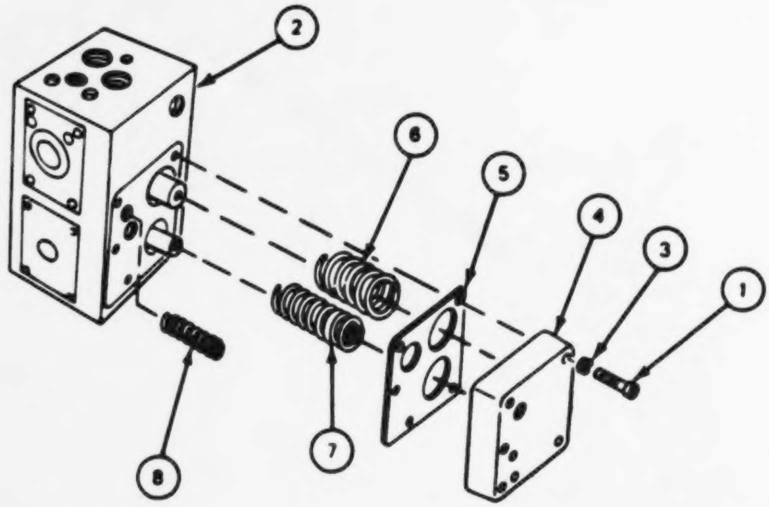
Step	Procedure
1.	Using hands, remove override spool (1) from valve body (2).
2.	Remove spring (3) from valve body (2).
3.	Using 3/16" Allen wrench, remove three screws (4), three lockwashers (5), and body cover (6) from valve body (2).
4.	Using O-ring extractor tool, remove preformed packing (7) from cap (6) (JPG). Throw preformed packing away.
5.	Remove gasket (8).
6.	Pull spring (9) and power spool (10) out of valve body (2).
	GO TO FRAME 2



13-106. HYDRAULIC VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 2

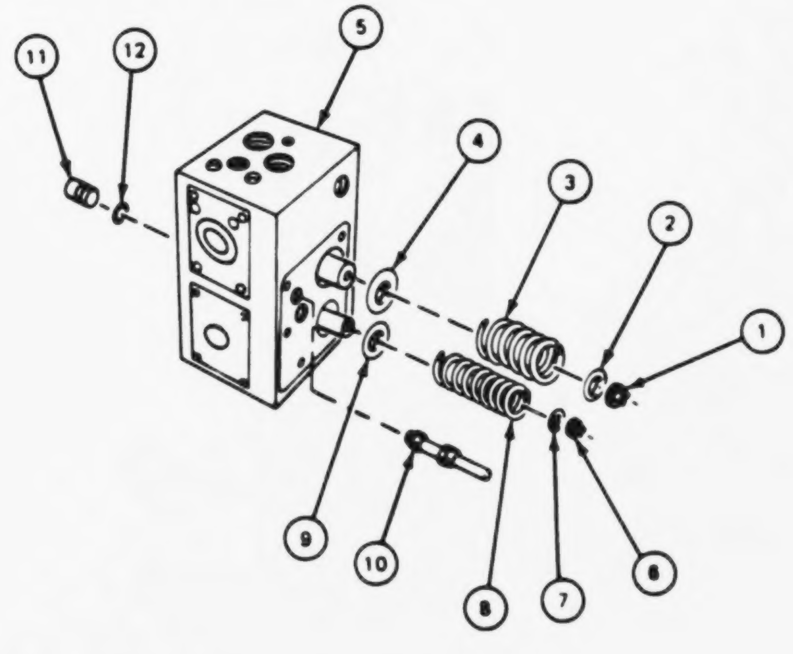
Step	Procedure
1.	Using 3/16" Allen wrench, carefully loosen five screws (1) until each is almost free of valve body (2).
2.	Carefully remove five screws (1) and five lockwashers (3) from cover (4) and remove cover and gasket (5) from valve body (2).
3.	Remove traversing spool spring (6), elevation spool centering spring (7), and regulator spool spring (8) from valve body (2). GO TO FRAME 3



13-106. HYDRAULIC VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 3

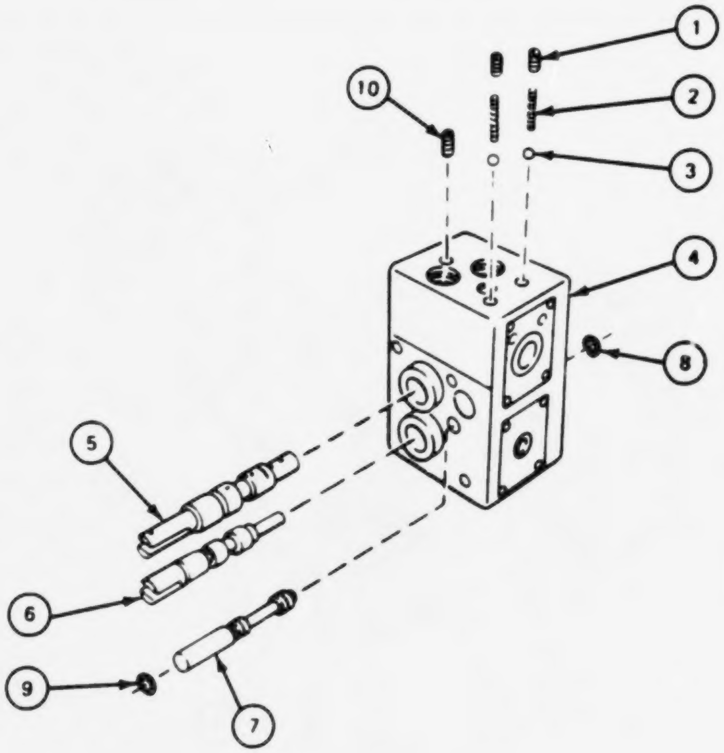
Step	Procedure
1.	Using pliers, remove retaining ring (1) that holds retainer (2), small traversing spool spring (3) and stop (4) (JPG).
2.	Remove retainer (2), spring (3), and stop (4) from valve body (5).
3.	Using pliers, remove retaining ring (6) that holds retainer (7), elevating spool small spring (8) and stop (9) (JPG).
4.	Remove retainer (7), spring (8), and stop (9) from valve body (5).
5.	Using low pressure regulating spool (10), push retainer (11) out of valve body (5). Remove spool (10).
6.	Using O-ring extractor tool, remove preformed packing (12) from retainer (11) (JPG). Throw preformed packing away. GO TO FRAME 4



13-106. HYDRAULIC VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Using 3/16" Allen wrench, remove two plugs (1), two springs (2), and two ball bearings (3) from valve body (4).
2.	Remove traversing spool (5) from valve body (4).
3.	Remove elevating spool (6) from valve body (4).
4.	Remove override piston (7) from valve body (4).
5.	Using O-ring extractor tool, remove preformed packing (8) from body (4) and preformed packing (9) from override piston (7) (JPG). Throw preformed packing away.
6.	Using 1/4" Allen wrench, remove plug (10) from valve body (4).
	GO TO FRAME 5



13-106. HYDRAULIC VALVE DISASSEMBLY PROCEDURE (CONT)

FRAME 5

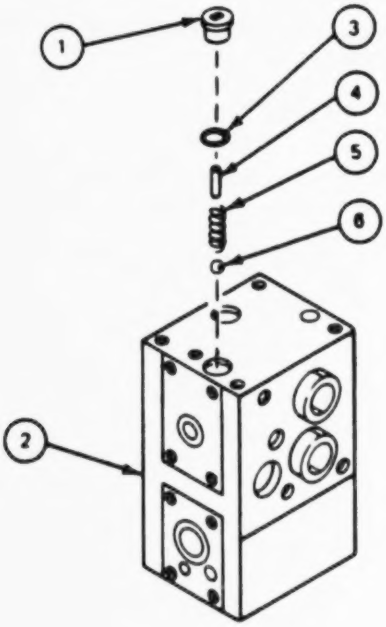
Step	Procedure
1.	Using 3/16" Allen wrench, remove plug (1) from valve body (2).
2.	Using O-ring extractor tool, remove preformed packing (3) from plug (1). Throw preformed packing away.
3.	Remove pin (4), spring (5), and ball (6) from valve body (2).

NOTE

Follow-on Maintenance Action Required:

Clean all parts (JPG).
Inspect and repair all parts (JPG).
Inspect hydraulic valve (para 13-104)

END OF TASK



13-107. HYDRAULIC VALVE ASSEMBLY PROCEDURE

TOOLS: 1/4" socket head screw key (Allen wrench)
3/16" socket head screw key (Allen wrench)
3/8" drive torque wrench (0 to 200 inch-pounds)
3/16" hex head socket (3/8" drive)
O-ring extractor kit
Internal retaining ring pliers

SUPPLIES: Hydraulic valve repair kit
Hydraulic fluid (item 10, App. A)
Lint-free cloths (item 21, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Use torque wrench
Install retaining ring
Install preformed packing

PRELIMINARY PROCEDURES: Inspect hydraulic valve (para 13-104)

GENERAL INSTRUCTIONS:

CAUTION

All hydraulic parts being assembled must be clean. Dirt can damage hydraulic parts.

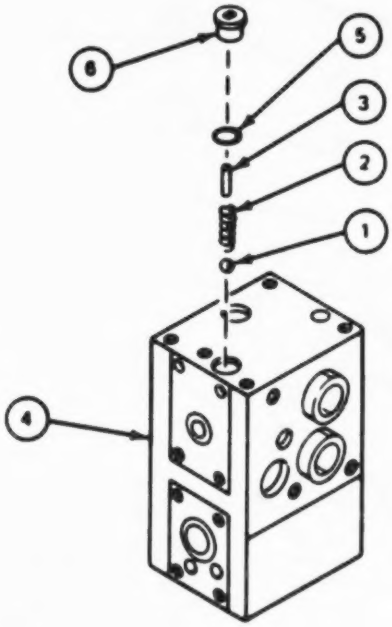
NOTE

Use lint-free cloth to keep hydraulic parts clean. Before assembly, lightly coat surfaces of hydraulic parts with hydraulic fluid.

13-107. HYDRAULIC VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 1

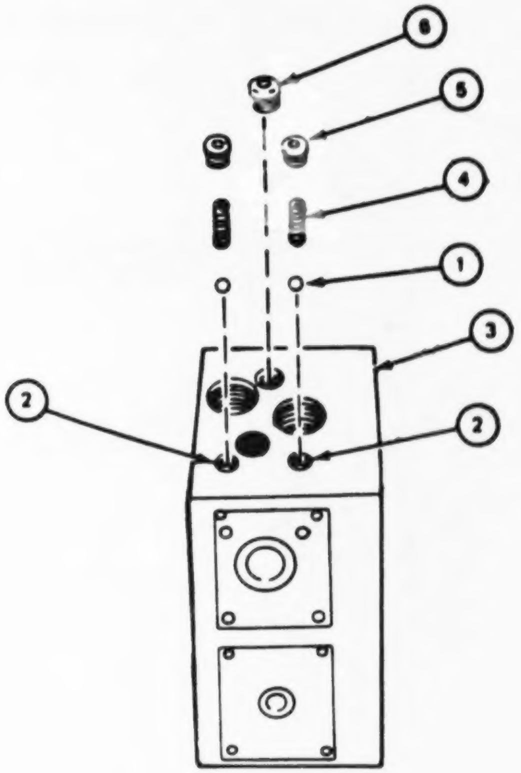
Step	Procedure
1.	Put ball (1), spring (2), and pin (3) in valve body (4).
2.	Using O-ring extractor tool, install preformed packing (5) on plug (6) (JPG).
3.	Using 3/16'' Allen wrench, put plug (6) in valve body (4).
	GO TO FRAME 2



13-107. HYDRAULIC VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 2

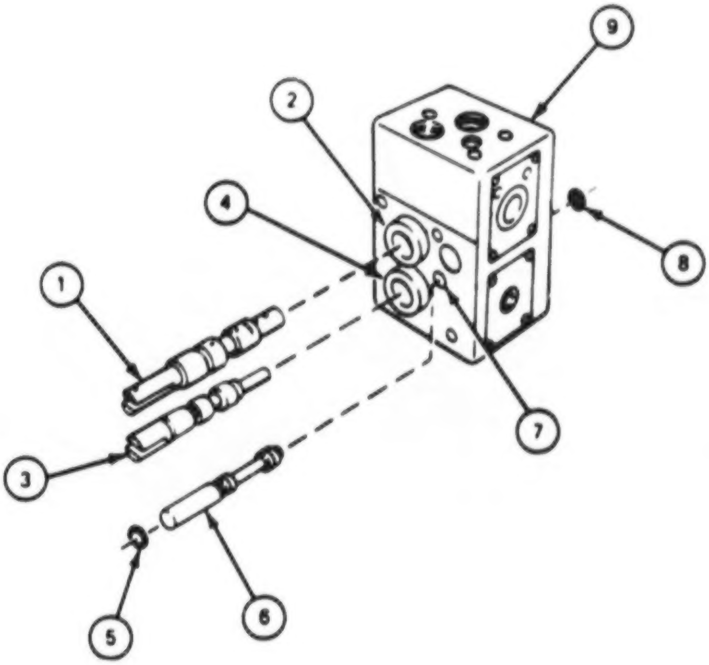
Step	Procedure
1.	Put one ball bearing (1) in each of two check valve ports (2) in valve body (3).
2.	Put one spring (4) in each of two check valve ports (2).
3.	Using 3/16" Allen wrench, put one plug (5) in each of two check valve ports (2). Tighten plugs.
4.	Using 1/4" Allen wrench, put plug (6) in body (3).
	GO TO FRAME 3



13-107. HYDRAULIC VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 3

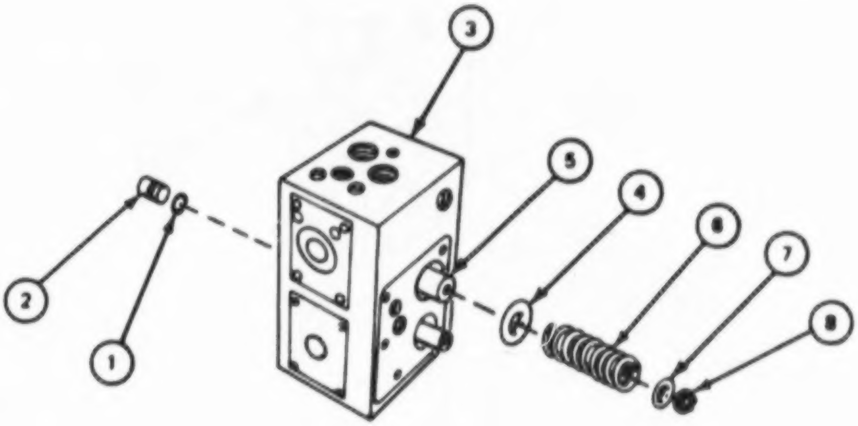
Step	Procedure
	NOTE Traversing spool (1) and elevating spool (3) must slide smoothly in valve block. Make sure spools are coated with hydraulic fluid before assembly.
1.	Put traversing spool (1), with slotted end out, in upper boss (2).
2.	Put elevating spool (3), with slotted end out, in lower boss (4).
3.	Using O-ring extractor tool, put preformed packing (5) on override piston (6) (JPG).
4.	Put override piston (6), small end first, in piston port (7).
5.	Using O-ring extractor tool, put preformed packing (8) in valve body (9) (JPG).
	GO TO FRAME 4



13-107. HYDRAULIC VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 4

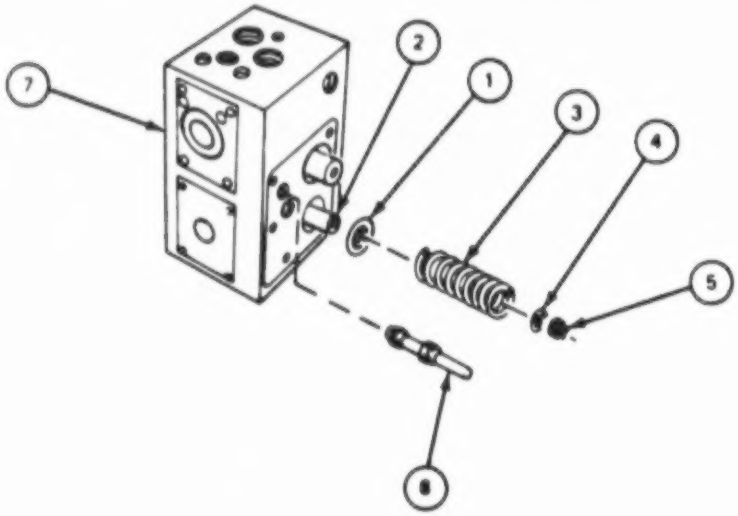
Step	Procedure
1.	Using O-ring extractor tool, put preformed packing (1) on retainer (2) and put retainer (2) in body (3) (JPG).
2.	Put stop (4) with raised part out, over end of traversing spool (5).
3.	Put traversing spool small spring (6) and retainer (7), with raised part in, over end of traversing spool (5).
	NOTE It may be necessary to get help to hold spring (6) compressed while retaining ring (8) is put in.
4.	Using pliers, secure retainer (7), spring (6), and stop (4) with retaining ring (8) (JPG).
	GO TO FRAME 5



13-107. HYDRAULIC VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 5

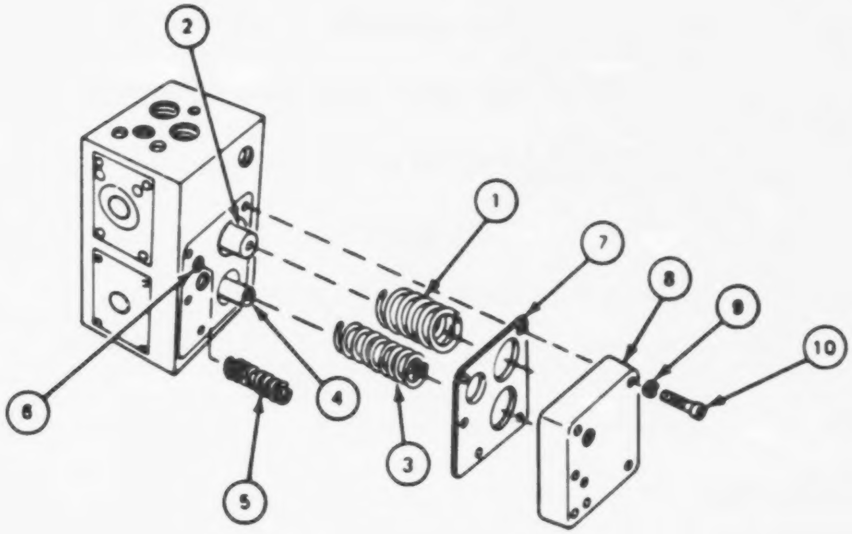
Step	Procedure
1.	Put stop (1), with raised part out, over end of elevation spool (2).
2.	Put elevation spool small spring (3) and retainer (4), with raised part in, over end of elevation spool (2).
	NOTE It may be necessary to get help to hold spring (3) compressed while retaining ring (5) is put in.
3.	Using pliers, secure retainer (4), spring (3), and stop (1) with retaining ring (5) (JPG).
4.	Put low pressure regulating spool (6) in valve body (7).
	GO TO FRAME 6



13-107. HYDRAULIC VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 6

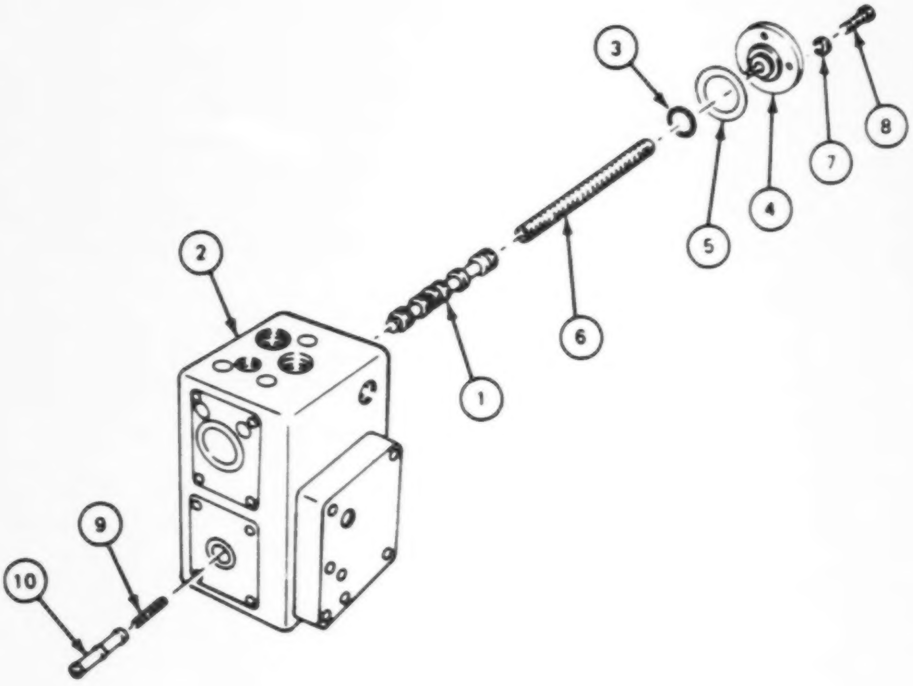
Step	Procedure
1.	Put traversing spool large spring (1) over spool end (2).
2.	Put elevation spool large spring (3) over spool end (4).
3.	Put regulator spool spring (5) in valve body (6).
	CAUTION Be careful when installing cover (8). Components in valve body are spring loaded. Tighten each screw (10) about one turn and then go to the next one until cover is in place.
4.	Put gasket (7) and cover (8) on valve body (6).
5.	Put five lockwashers (9) and five screws (10) in cover (8). Press down on cover (8) to compress springs.
	NOTE Start first screw (10) in corner of cover having the least spring tension against it. (Lower left hand corner.)
6.	Using 3/16" Allen wrench, slowly tighten each screw (10) so that cover (8) is evenly tightened down on the valve body (6).
7.	Using torque wrench with hex head socket, torque screws (10) to between 60 and 85 inch-pounds (JPG).
	GO TO FRAME 7



13-107. HYDRAULIC VALVE ASSEMBLY PROCEDURE (CONT)

FRAME 7

Step	Procedure
1.	Put power spool (1) in valve body (2).
2.	Put packing (3) in body cover (4).
3.	Put gasket (5) on valve body (2).
4.	Put spring (6) on power spool (1).
5.	Using 3/16" Allen wrench, put three lockwashers (7) and three screws (8) through body cover (4) and in valve body (2).
6.	Using torque wrench with hex head socket, torque screws (8) to between 60 and 85 inch-pounds (JPG).
7.	Put spring (9) in override spool (10) and put in valve body (2).
	NOTE Follow-on Maintenance Action Required: Install power solenoid and override solenoid (para 13-103). Test hydraulic valve (para 13-105). Install hydraulic valve (para 13-99). Test gunner's control (para 13-72).
	END OF TASK



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By Order of the Secretary of the Army:

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General, United States Army
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3		2		Item 10. Change illustration. Reason: Tube end shown assembled on wrong side of lever cam.
109		51		Item 3. The NSN and P/N are not listed on the AMDF nor the MCRL. Request correct NSN and P/N be furnished.
2-8			2-1	Preventive Maintenance Checks and Services. Item 7 under "Items to be inspected" should be changed to read as follows: Firing linkage and firing mechanism pawl.
12	1-6a			Since there are both 20- and 30-round magazines for this rifle, data on both should be listed.

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Charts Transposed to

End of Volume.

THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 Lb
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches
1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet
1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles

CUBIC MEASURE

1 Cu Centimeter = 1000 Cu Millimeters = 0.06 Cu Inches
1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

TEMPERATURE

$5/9\,({}^{0}F - 32) = {}^{0}C$
212^{0} Fahrenheit is equivalent to 100^{0} Celsius
90^{0} Fahrenheit is equivalent to 32.2^{0} Celsius
32^{0} Fahrenheit is equivalent to 0^{0} Celsius
$9/5\,C^{0} + 32 = F^{0}$

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621

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CM.
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6

TA089991

LEGEND:

1. GUNNER'S DOMELIGHT
2. GUNNER'S CONTROL BOX
3. STABILIZATION CONTROL SELECTOR
4. HAND TRAVERSING DRIVE
5. GUNNER'S CONTROL
6. AZIMUTH INDICATOR
7. BALLISTIC COMPUTER
8. MANUAL TRAVERSING HANDLE
9. TURRET HYDRAULIC SYSTEM FILTER
10. TRAVERSE STABILIZER VALVE
11. GUNNER'S FOOTGUARD
12. 7.62 MM AMMUNITION BOX
13. POWER PACK BLOWER
14. TURRET POWER AND SEARCHLIGHT RELAY BOX
15. GUNNER'S FOOTREST PLATE
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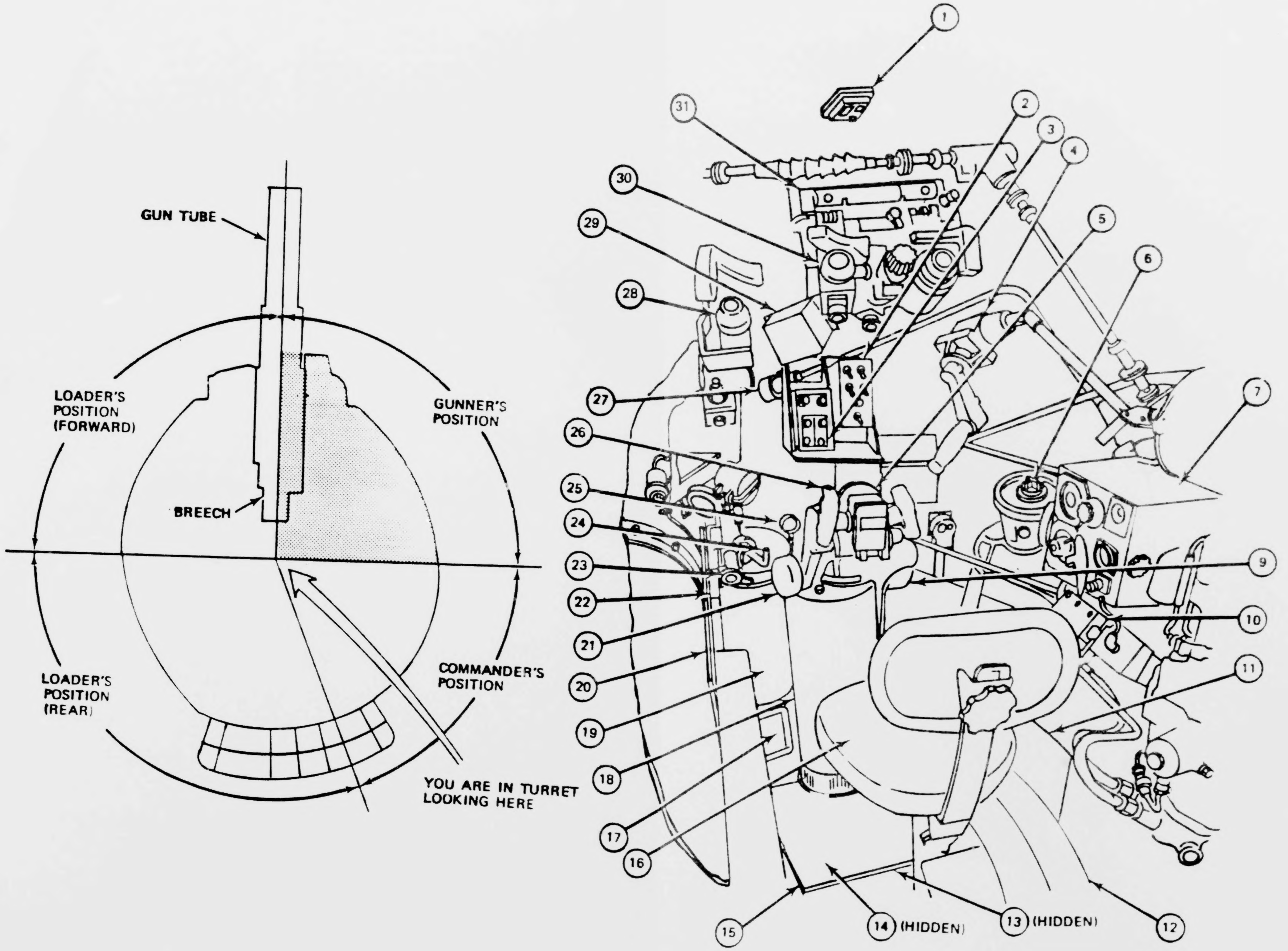
27. SUPERELEVATION ACTUATOR
28. ARTICULATED TELESCOPE M105D
29. TURRET GUN FIRING RELAY BOX
30. GUNNER'S PERISCOPE
31. GUNNER'S PERISCOPE MOUNT M118


GUN TUBE
BREECH
LOADER'S POSITION (FORWARD)
GUNNER'S POSITION
LOADER'S POSITION (REAR)
COMMANDER'S POSITION
YOU ARE IN TURRET LOOKING HERE
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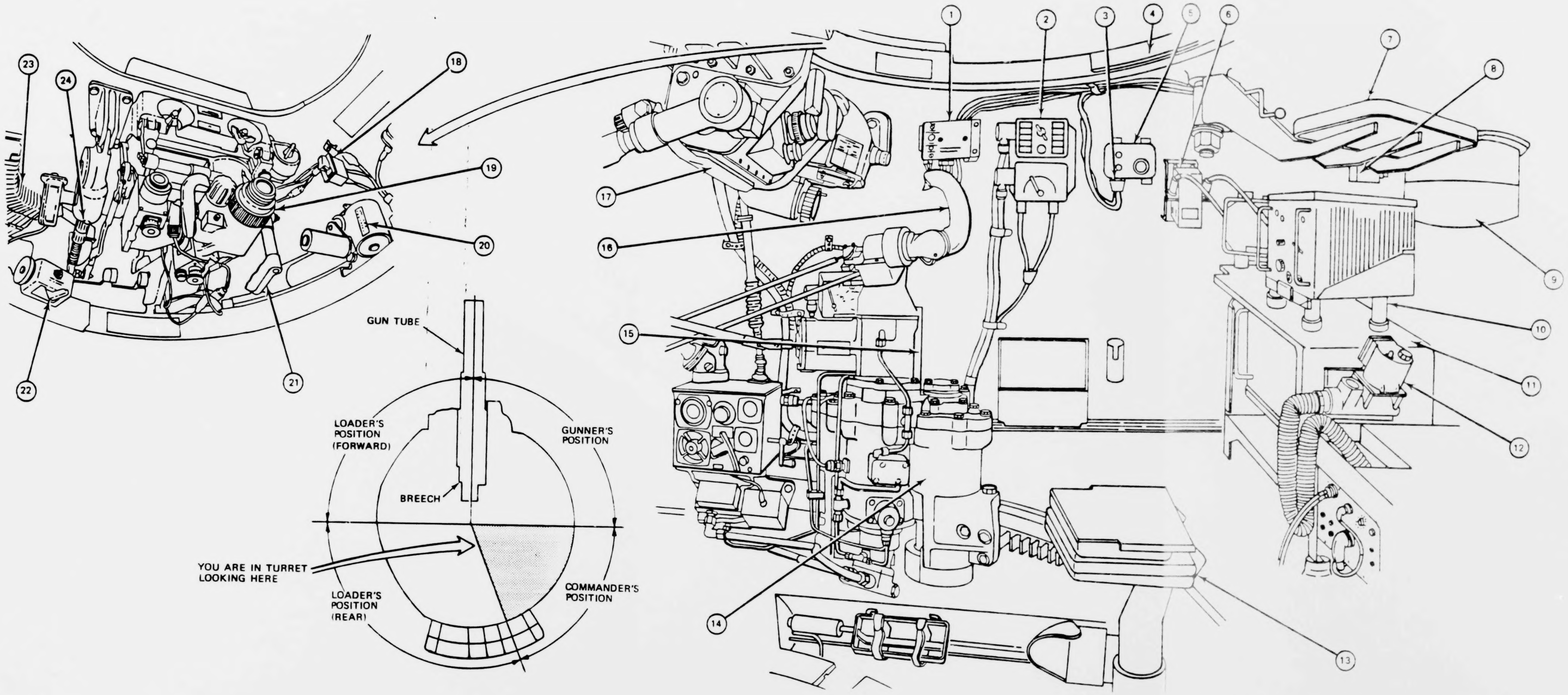
FO-1. EQUIPMENT LOCATION INFORMATION - GUNNER'S POSITION

LEGEND:

1. CUPOLA ELECTRICAL POWER CONTROL PANEL
2. COMMANDER'S INTERPHONE CONTROL BOX
3. SEARCHLIGHT DUMMY PLUG
4. BACKREST PAD
5. SEARCHLIGHT CONTROL BOX
6. BATTLE OVERRIDE SWITCH (RADIO)
7. COMMANDER'S SWING SEAT
8. INTERCONNECTING BOX
9. TURRET VENTILATING BLOWER
10. TURRET RADIO SUPPORTS
11. RADIO RACK
12. COMMANDER'S ELECTRIC AIR FILTER HEATER
13. COMMANDER'S SEAT
14. TURRET TRAVERSING MECHANISM
15. ANTI–BACKLASH MECHANISM
16. COMMANDER'S CONTROL HANDLE
17. FIRE CONTROL RANGEFINDER
18. CUPOLA GUN SAFETY SWITCH AND GUARD
19. COMMANDER'S PERISCOPE
20. CUPOLA AZIMUTH GEAR BOX
21. SHIELD OPERATING HANDLE
22. CUPOLA AZIMUTH LOCK
23. FLEXIBLE CHUTE
24. ELEVATION SCREW JACK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GUN TUBE
LOADER'S POSITION (FORWARD)
GUNNER'S POSITION
BREECH
YOU ARE IN TURRET LOOKING HERE
LOADER'S POSITION (REAR)
COMMANDER'S POSITION
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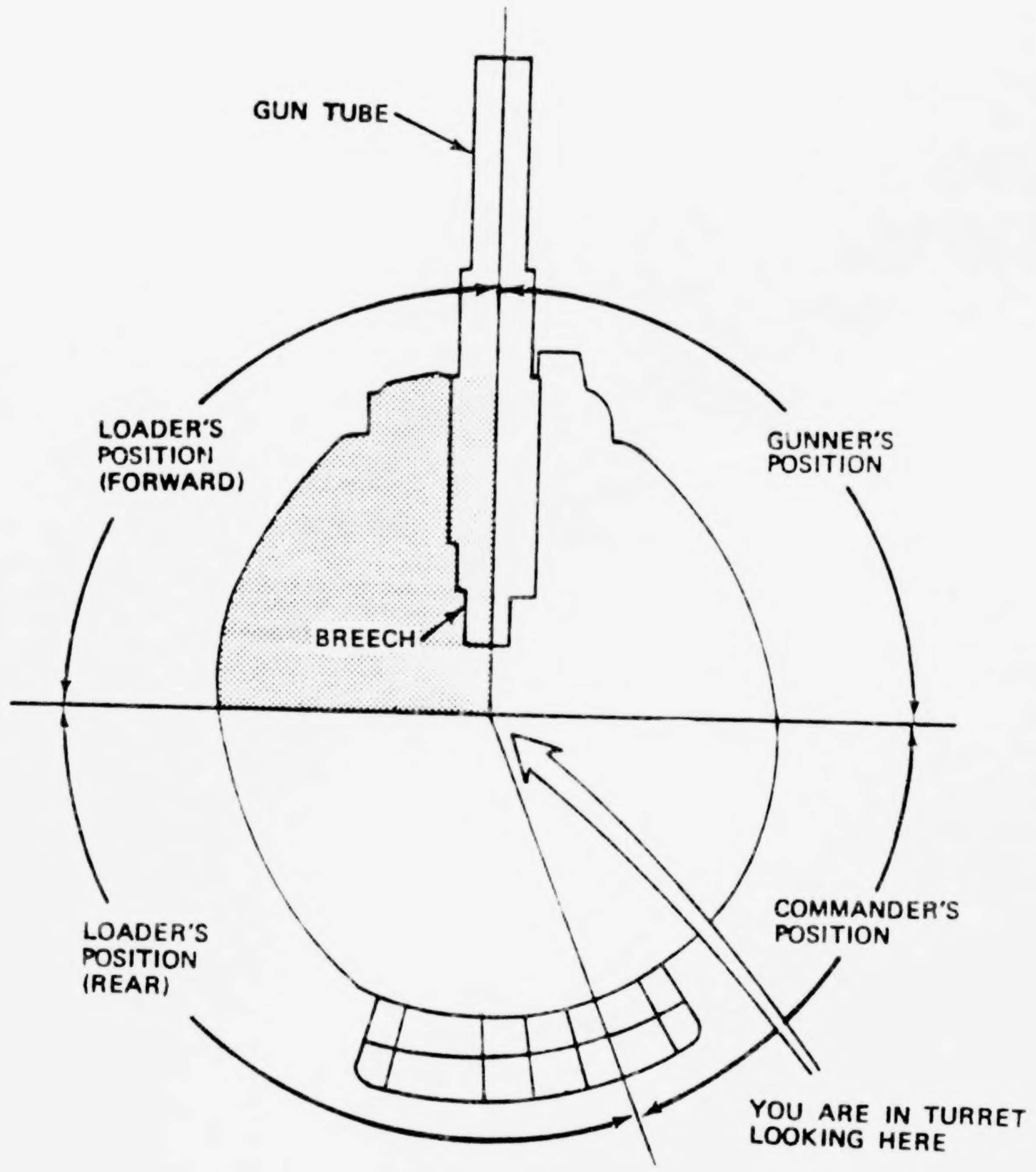
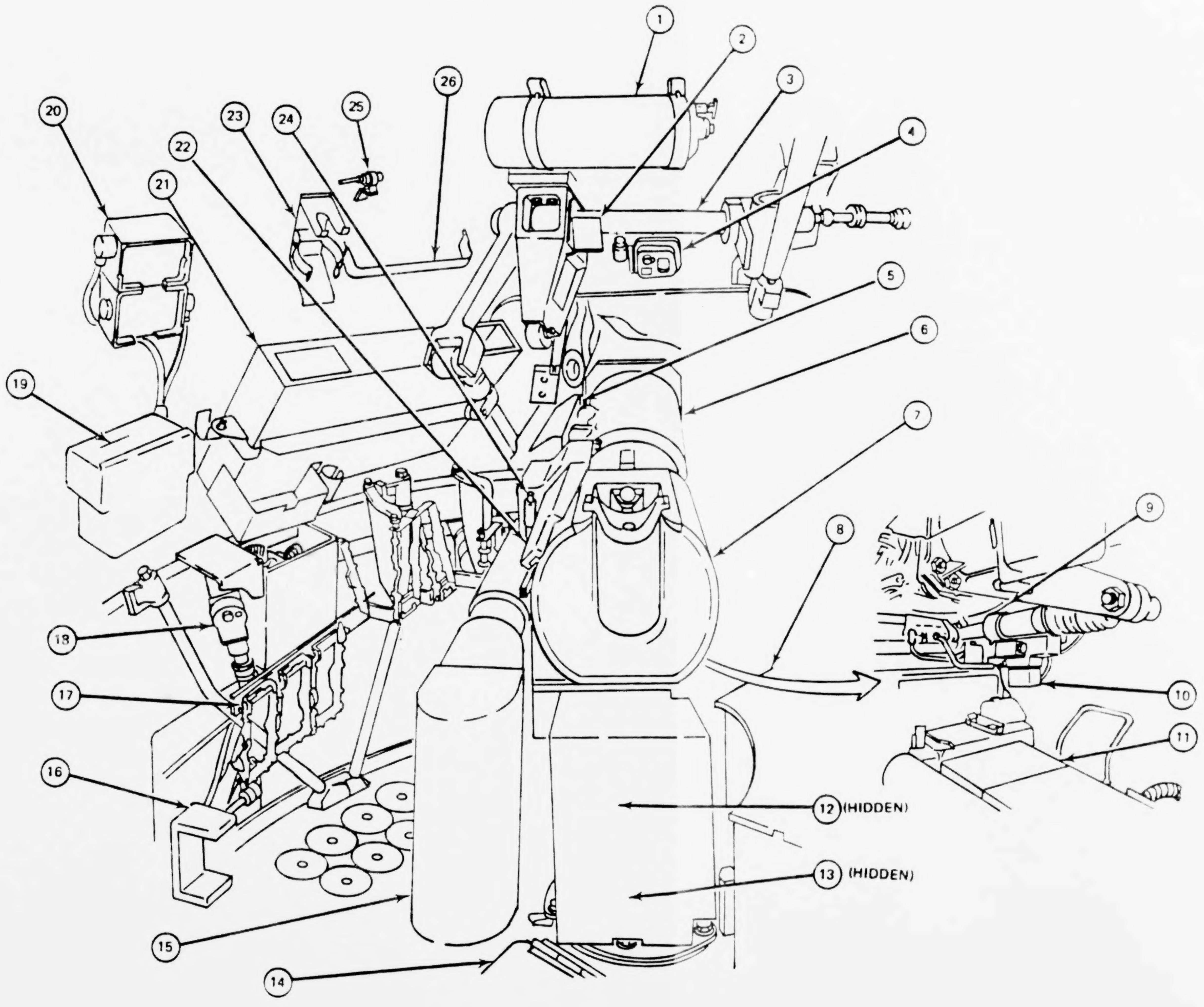
FO-2. EQUIPMENT LOCATION INFORMATION - COMMANDER'S POSITION

LEGEND:

1. REPLENISHER
2. GUN ELEVATION INTERFERENCE SWITCH
3. BALLISTIC DRIVE
4. LOADER'S DOMELIGHT
5. MACHINE GUN MOUNT
6. 105–MM GUN
7. BREECH
8. CALIBER .50 AMMUNITION BOXES
9. ELEVATING MECHANISM
10. ELEVATION STABILIZER VALVE
11. PERISCOPE STOWAGE BOX
12. STABILIZATION CONTROLLER UNIT
13. TURRET ELECTRICAL SLIPRING
14. BATTERY ACCESS DOOR
15. 105–MM AMMUNITION THREE ROUND LEFT SIDE RACK
16. FIRE EXTINGUISHER MOUNTING BRACKET
17. 105–MM AMMUNITION RACK RETAINER
18. LOADER'S ELECTRIC AIR FILTER HEATER
19. LOADER'S PERISCOPE BOX
20. LOADER'S INTERPHONE CONTROL BOX
21. 7.62–MM READY ROUND AMMUNITION BOX AND COVER
22. LOADER'S GUARD
23. OILCAN MOUNTING BRACKET
24. LOADER'S SAFETY SWITCH
25. RADIATION DETECTOR
26. CANTEEN MOUNTING BRACKET


GUN TUBE
LOADER'S POSITION (FORWARD)
GUNNER'S POSITION
BREECH
LOADER'S POSITION (REAR)
COMMANDER'S POSITION
YOU ARE IN TURRET LOOKING HERE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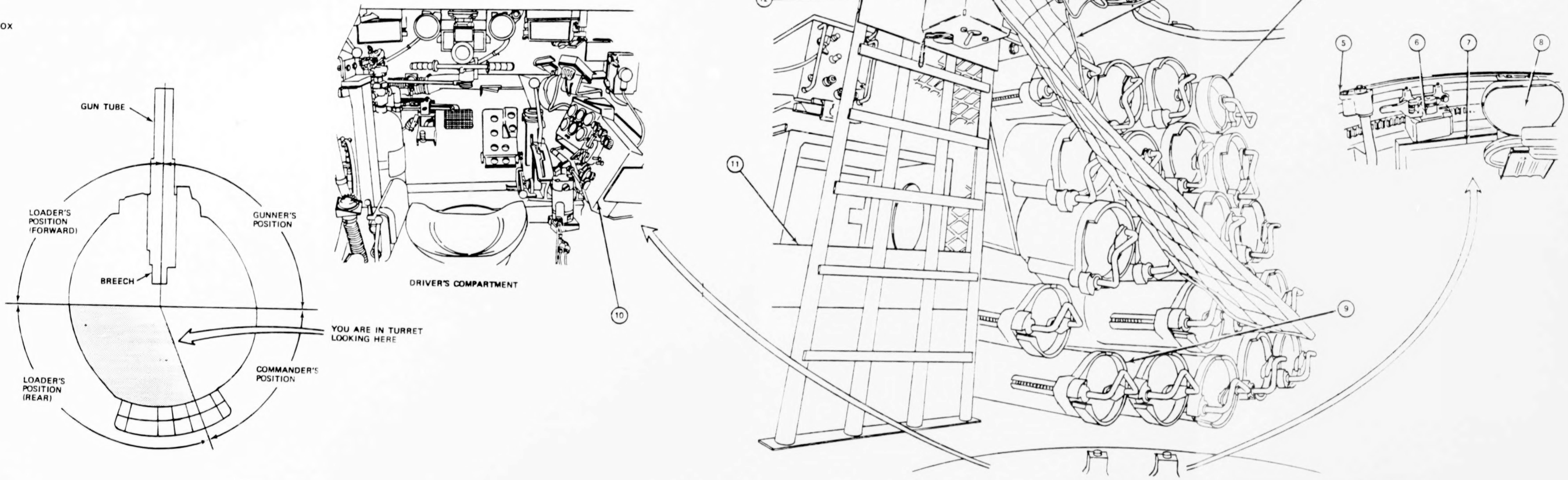
FO-3. EQUIPMENT LOCATION INFORMATION - LOADER'S POSITION (FORWARD)

LEGEND:

1. STABILIZATION SHUT–OFF BOX
2. COMMANDER'S DOMELIGHT
3. SHELL EJECTING SHIELD
4. EIGHTEEN ROUND AMMUNITION STOWAGE RACK
5. SHELL RETURN HANGER
6. TURRET TRAVERSE LOCK
7. TURRET PLATFORM GUARD
8. LOADER'S SEAT
9. THREE ROUND AMMUNITION STOWAGE RACK
10. DRIVER'S MASTER CONTROL PANEL
11. ODDMENT TRAY
12. RADIO GUARD
13. TURRET VENTILATING BLOWER CONTROL BOX


GUN TUBE
LOADER'S POSITION (FORWARD)
GUNNER'S POSITION
BREECH
YOU ARE IN TURRET LOOKING HERE
LOADER'S POSITION (REAR)
COMMANDER'S POSITION
DRIVER'S COMPARTMENT
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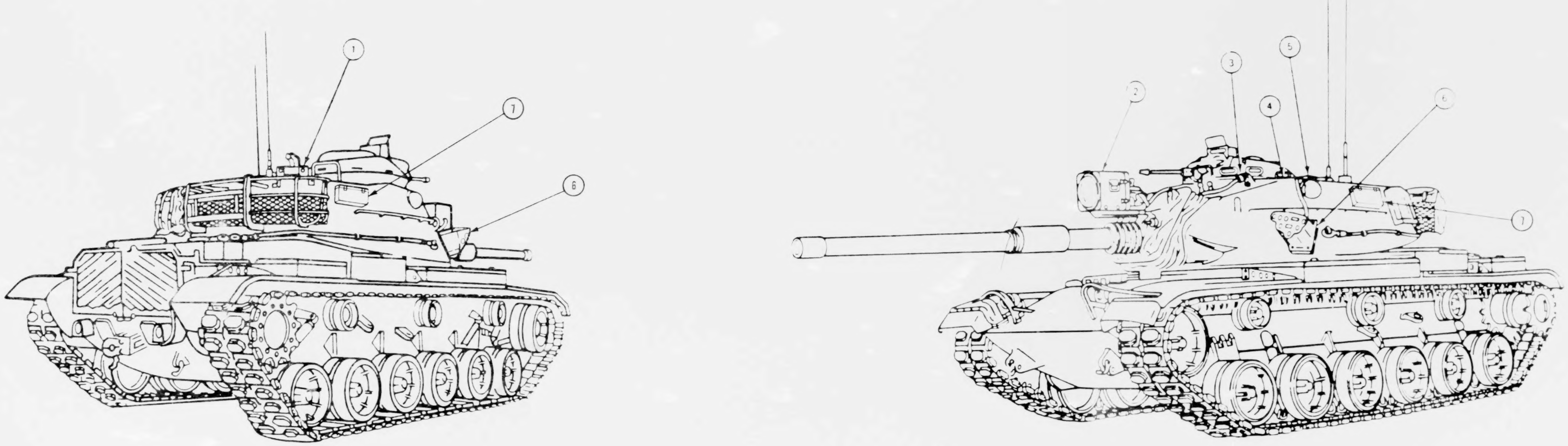
FO-4. EQUIPMENT LOCATION INFORMATION - LOADER'S POSITION (REAR)

LEGEND:

1. SEARCHLIGHT STOWAGE BOX
2. SEARCHLIGHT
3. SEARCHLIGHT CONNECTOR
4. LOADER'S ESCAPE HATCH
5. HOUSING
6. SMOKE GRENADE DISCHARGER
7. STOWAGE BOX



FO-5. EQUIPMENT LOCATION INFORMATION - OUTSIDE TANK